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DEVELOPMENT OF A SYSTEM FOR AN EDUCATIONAL PRODUCTS INFORMATION EXCHANGE. FINAL REPORT.

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THIS STUDY WAS UNDERTAKEN TO DESIGN AN EASILY ACCESSIBLE NATIONWIDE SYSTEM FOR EXCHANGING DESCRIPTIVE, EVALUATIVE PRODUCT INFORMATION AMONG ALL SECTORS OF THE EDUCATIONAL COMMUNITY ON A COOPERATIVE COST-SHARING BASIS. THE FEASIBILITY OF SUCH A COLLECTION AND EXCHANGE OF DESCRIPTIVE AND EVALUATIVE INFORMATION ABOUT INSTRUCTIONAL MATERIALS SYSTEMS AND EQUIPMENT AMONG EDUCATIONAL PROFESSIONALS IS INVESTIGATED AS A SELECTION BASE FOR CURRICULUM USE OR DESIGN IMPROVEMENT. AMONG THE TOPICS DISCUSSED ARE DESCRIPTIONS OF (1) THE EXPERIMENTAL USE OF QUESTIONNAIRES AND INTERVIEW PROTOCOLS, (2) THE POSSIBLE TECHNIQUES FOR PEDAGOGICAL ANALYSIS OF MATERIALS, (3) A PRELIMINARY TRAINING SESSION FOR INFORMATION GATHERERS, (4) A PROPOSED FOUR-STATE TRIAL TO TEST T E EXCHANGE SYSTEM, (5) PRELIMINARY SYSTEMS DESIGNS FOR THE EXCHANGE, AND (6) THREE MODES OF SERVICE TO BE MADE AVAILABLE ON A COOPERATIVE COST-SHARING BASIS TO THE EDUCATIONAL COMMUNITY. THE STUDY YIELDS RESULTS WHICH INDICATE THAT COLLECTION, SYNTHESIS, AND DISSEMINATION OF EDUCATIONAL PRODUCT INFORMATION IS A FEASIBLE ACTIVITY. (HW)

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DEVELOPMENT OF A SYSTEM FOR AN EDUCATIONAL PRODUCTS INFORMATION EXCHANGE

OCTOBER, 1967

U.S. DEPARTMENT OF
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DEVELOPMENT OF A SYSTEM FOR AN EDUCATIONAL PRODUCTS INFORMATION EXCHANGE

P. Kenneth Komoski

Educational Products Information Exchange Institute

New York, New York

November 10, 1967

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PREFACE

The study herein reported was in many ways an experiment, yet it cannot be called an experimental research study in the ususal sense of that phrase. It was by design a product-oriented study and therefore it leans toward the "development" end of the research-and-development continuum. Neverthless, as the study proceeded it was greatly influenced by previously conducted research and the willingness of a number of researchers who had conducted that research to work with the project staff in interpreting their findings in light of the task at hand -- the development of an effective means of exchanging educational product information. A comprehensive list of all the members of the research community who in some way contributed to the work described in this report would be lengthy, and might appear to be an argumentum ad homines for the worth of the work described herein. However, there are a few researchers whose contribution to the development of the design of the product information exchange, as it evolved in the course of this study, has been such that it would be impossible to fail to mention them individually. They are:

Dr. Terry Denny, now of the EPIE staff but formerly Associate Professor of Education and Psychology, Purdue University

Dr. J. A. Easley, Jr., Associate Professor of Education, University of Illinois

Dr. Robert T. Filep, Education Systems Project, System Development Corporation

Dr. Frederick L. Goodman, Associate Professor, School of Education, University of Michigan

Dr. Ira J. Gordon, Director, Institute for Development of Human Resources, College of Education, University of Florida

Dr. Robert E. Stake, Associate Director, Center for Instructional Research and Curriculum Evaluation, College of Education, University of Illinois

Dr. Raymond Wyman, Professor of Education, Audiovisual Center, University of Massachusetts

In addition to the work of these individuals the project has had the benefit of direct assistance and a general willingness to cooperate from a number of professional associations. Particular mention and gratitude are due the Commission on Technical Standards of the Department of Audiovisual Instruction, NEA, and the Commission on Instructional Theory of the Association for Supervision and Curriculum Development. The work of these commissions has had considerable influence on the study, through the advice and counsel of their respective chairmen, Drs. Wyman and Gordon.

The Director also wishes to acknowledge his debt to Dr. Joseph L. Dionne, who helped organize the study in its early stages but who left the project staff soon after the study began. Members of the staff who carried out the bulk of the "in house" work, and to whom the Director is particularly indebted, are Mrs. Anne Abramovitz, Mr. Kenneth E. Baranski, and Miss Betty Braxton Preston.

SUMMARY

School decision-makers and designers and devisors of instructional materials, systems, and equipment are in need of systematically collected and disseminated descriptive, analytical, and performance data on such materials, systems, and equipment. In the course of the study herein described, the Educational Products Information Exchange (EPIE) Institute has planned and outlined a system for the collection, synthesis, and dissemination of such information.

Plans and procedures include meetings between users and producers of equipment to discuss what characteristics of "hardware" need be described to permit informed selection. Professionals at two universities have devised procedures for analyzing content and explicating the pedagogical assumptions underlying the make-up of instructional materials. Interview protocols for use with teachers have been devised and tested, as have methods for training school personnel to use EPIE information collection techniques. A pilot study of the entire system has been designed, and a preliminary version of a comprehensive systems design for the Exchange has been completed and is being revised in preparation for the proposed pilot study.

The Exchange is designed to develop publicly and in the public interest, and to call upon the assistance of educational professionals in its development and operation. Plans for service include broadcast of general information through publications and, eventually, responses to ad hoc questions and tailor-made service for specific needs. Subscription rates to make services self-supporting will be developed.

INTRODUCTION

New media, the "systems approach" to education, new text books, innovative techniques, new curricula, more Federal Funds -- all these and more factors have come, in recent years, to increase the school decision-maker's hopes for the optimum pupil-material match, as they have concurrently reduced the possibility of the decision-maker's being able to look at all available materials before trying to make that match.

The same factors, of course, have affected the work of the producer of educational materials, who is supplying that most challenging market in educational history without accurate, individualized knowledge as to what users want or how available products achieve or fall short of success.

It has, therefore, become increasingly apparent that schools and producers alike are in pressing need of effectively organized, accurate, accessible information about educational materials, equipment, and systems, and that the use of such information in the selection, use, and design of such products would have a salutary effect on educational practice.

The present study* was undertaken for the purpose of designing an easily accessible nationwide system for exchanging descriptive, evaluative product information among all sectors of the educational community, on a cooperative cost-sharing basis. Educational professionals in schools and industry will be encouraged to contribute to and use this product information exchange as a regular part of their responsibilities, thus not only improving the basis for their own professional judgments but also contributing to the improvement of educational technology in general.

The designers of this exchange approached their task with the belief that their research must produce the design of a service that will function in the public interest, utilizing the assistance, advice, and special competencies of many cooperating professionals. Furthermore, it must be designed so that after its developmental period, it will be supported completely by those who make use of its service. It must be responsive to the needs of its users, and must guarantee a carefully developed and clearly defined base for the data which it reports. It must not only take due notice of new product developments, but must anticipate them and seek out early reports of them.

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* It should be pointed out that the Educational Products Information Exchange (EPIE) Institute, the contractor for the present study, has operated independently only since August 1, 1967. Prior to that time it existed as a division of the Institute for Educational Development, and the beginning of this study was undertaken there, under an earlier contract.

The builders of the exchange recognize that the great variety of educational purposes and practices makes it impossible, even if it were desirable, to "rank" or evaluate educational products in a universal sense; what works well in one educational setting with one set of students will not necessarily work well or be deemed suitable elsewhere. What works poorly in a first marketed version may be greatly improved after revision. Therefore the most useful information will be reports of systematically sampled users as to the performance of a product in specific institutional settings over time, synthesized with the producer's description of his product and analyses of the product by independent researchers. These are the three types of product information the present study has shown to be useful and feasible to gather, synthesize, and disseminate. The study also has explored the development and preliminary use of specific techniques for identifying and processing these three basic types of product information.

THE ATTACK ON THE PROBLEM

The Enlistment of the Aid of the Professional Community

The EPIE Advisory Board

The designers of the educational products information exchange saw as the first order of business the establishment of continuing cooperative arrangements with institutions and agencies engaged in relevant research, associations of educators, and associations of producers. Visits to and correspondence with such organizations were followed by a series of exploratory meetings for groups whose members had shown or might be expected to show interest in the exchange's aims and development.

The first of the series of group meetings came in early December, 1966, when representatives of educational administration organizations met to hear about, react to, and help shape the development of the exchange (by then known as EPIE, its acronym). They suggested that representatives of their and other appropriate associations be constituted as an EPIE Advisory Board, which would continue to play a role in the development of the exchange. Directors and executive secretaries of teacher associations, meeting the next month (January 1967), asked to be included on the Advisory Board. Representatives of producer associations, also meeting that month, were interested in hearing of EPIE's progress as it developed, but were, for the most part, not enthusiastic about direct involvment in its development.

Thirty associations (listed as Appendix A) now serve on the Advisory Board which has had two formal meetings to hear about and advise on developments. Between meetings individual representatives have cooperated with EPIE in a variety of ways, ranging from identification of key personnel who might take an active part in EPIE's development to cooperation in conducting meetings and training sessions.

One of the Advisory Board's most important function will be the nomination of members for professional auditing committees, who at least annually will review EPIE's procedures and practices, thus providing an external source of evaluation and guidance in specific endeavors.

EPIE's Consultants

During its development EPIE has received the substantive help of a diverse group of consultants, some of whom are connected with cooperating associations and others of whom have been asked or have volunteered to cooperate because of the peculiar relevance of their work and interest to EPIE's purposes. In the course of the present study consultants have not only advised on overall planning but, as subsequent sections will show, have developed preliminary systems designs, run initial training courses for information gatherers, chaired cooperatively sponsored meetings, devised experimental questionnaires and interview protocols, devised methods for analyzing instructional materials, and in general supplemented and augmented the work of the small central staff.

Some thirty consultants, who volunteered their time, met for three days in December, 1966, to discuss in detail the sorts of information EPIE must collect in order to be most useful, and how that information might best be collected. It became increasingly obvious that EPIE must, in order to develop the soundest possible procedures to insure the dependability of its information, try its collection procedures, its analysis techniques, its operational definitions, and its dissemination system in a series of pilot studies, and plans were set in motion to devise such studies.

The Definition of Useful Product Information Types and Services

Examination of currently available product information, discussion of selection practices with school personnel, and the experience-based advice of the consultants who discussed the matter in detail at the December work conference bore out the contention on which EPIE was founded that systematically organized information giving comparable data on similar products was a pressing need among school decision-makers. The same sources corroborated the need for performance data, which the founders of EPIE had foreseen, and emphasized the usefulness such information would have for producers as well as for school selection personnel. They emphasized, too, the necessity for relating performance information to the instructional setting, pointing out that EPIE could make a valuable contribution to education by establishing empirically the role of various factors known and suspected to have effects on the performance of instructional materials. Finally, these same sources made clear the need for another kind of information: independent explications of the pedagogical philosophy and assumptions about students, teachers, and the subject matter which are inherent in the content and structure of instructional materials.

Repeated discussion of the needs EPIE planned to fill and of the steps to be taken to do so made it clear that helpful information would be in hand and should be made available long before the full measure of service can be developed. It was equally clear that in certain situations the full measure of service would not be called upon, a point which strengthened the determination to offer general information early in EPIE's career and to add various levels of ad hoc information as development permitted. Attached charts, Figures 1 and 2, show information and service schemes.

Figure 1

Types of Educational Product Information to Be Collected by The Educational Products Information Exchange

Type	Sources
Product Producer Information	a) Producers' catalogues, reports of surveys and validation studies, promotion pieces, advertisements, etc. b) Direct contact with the producer, in meetings or by questionnaire.
Product Analyst Information	a) Reports of independent scholars and researchers in universities, regional laboratories, research and development centers, state education departments, etc. who will be commissioned by EPIE. b) Professional journals, monographs, conference proceedings, etc.
Product User Information	a) Inventories and questionnaire responses of teachers, students, administrators, and parents surveyed by EPIE. b) Classroom observations undertaken by EPIE. c) Reports of the results, rating, scale results, etc., solicited by EPIE.

Figure 2

Modes of Subscriber Service to be Offered by The Educational Products Information Exchange

Mode of Service	Degree of Service's Focus on the Subscriber	Begin First Level of Service	Service Fully Operational
I. Broadcast Mode: transmission of generalized product information	Diffuse, incidental	September 1967	September 1969
II. Responsive Mode: acting on standard inquiries with data in system	Marginal definition	December 1968	January 1970
III. Interactive Mode: dialogue between EPIE and subscriber beyond standard inquiry protocols	Near maximal definition	May 1969	January 1971
IV. Customized Mode: tailoring system and field studies, if necessary, to gather or exchange information not provided by Service Modes I, II, III	Adjust until highly focused	September 1970	January 1971

The Establishment of Limits for the First Pilot Study

Several factors worked together to set the various necessary limits for the first pilot study. The Eastern Regional Institute for Education, a regional education laboratory which operates in New York State and part of Pennsylvania, had offered help from EPIE's inception, and on its advice it was decided to conduct the study in four states jointly served by that and another regional laboratory, Research for Better Schools, Inc., active in the rest of Pennsylvania and in New Jersey and Delaware. The encouraging cooperation received from the two laboratories was matched by the state education authorities in all four states, who agreed to petition the U.S. Office of Education, under Title V of the Elementary and Secondary Education Act, for funds to conduct the first pilot study within their borders.*

The determination of curriculum area and level limits was based on the results of a study conducted in the fall of 1966 by the Institute for Educational Development to discover which product classes were of immediate interest to school decision-makers. The staff investigated various market reports dealing with projections of what schools would buy in the immediate future, and compilations of sales figures for recent years. More importantly, and with more clearcut results, the Institute for Educational Development sent questionnaires to school superintendents (nominated for the purpose by the Executive Secretary of the American Association of School Administrators) all over the country to inquire as to their immediate interests. This survey indicated greatest interest in the reading curriculum and in equipment for using videotape. Unwilling in its first trial to take on such very complex aspects of teaching, EPIE moved to the somewhat more manageable "runners-up" in the Institute for Educational Development's survey: elementary school science materials and overhead projectors.

The Design of a Data System for the Exchange of Information

In the course of the December work conference, general attention was given to the design of an information storage and retrieval system for EPIE by all the consultants present and in particular by the representatives of the Community Systems Foundation, Ann Arbor, Michigan, with whom EPIE had contracted for a preliminary statement of such a design. The design formed part of the subject matter at a subsequent consultants' work conference, in April of 1967, and in late April the Community Systems Foundation submitted to EPIE the document attached as Appendix B. Experience over the summer indicates that modifications in the design will be necessary; Appendix C outlines a broader concept which more nearly reflects the present intentions for EPIE's development over the next three years.

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*Changes in and debate on the initially proposed bill to extend the Elementary and Secondary Education Act have so far prevented any implementation of this proposal.

The primary aim of the information storage and retrieval system design for EPIE is not noticeably different from that for any such design--the rapid and efficient entry of new data into the system and the rapid and efficient retrieval of data relevant to an input request. It is expected, however, that input requests may be very complex, and special attention must be given to retrieval software to accommodate them. Also, much attention must be given to the selection for synthesis of the most up-to-date information of all three types on any given product, with earlier information retained for recall if needed. Still further calls on the system will have to do with investigation of what stored information is being used, including the entry of feed-back information on its perceived effectiveness.

It should be noted that present ideas about an information storage and retrieval system for EPIE indicate the desirability of arranging for shared time in existing computers--perhaps ones located in centers where activities related to EPIE are going on--rather than the establishment of an EPIE computer complex. Further experience with EPIE, together with the inevitable computer improvements during the projected three-year development period may change the thinking on this matter.

The Development of Information-Gathering Techniques*

Assembling Producer Information

It became obvious as EPIE began to collect information on overhead projectors, the equipment class to be reported on first, that some correlation of availability of and need for information was called for. Accordingly EPIE, working with the Department of Audiovisual Instruction of the National Education Association (a member of the EPIE Advisory Board), drew up an exhaustive list, containing every characteristic an overhead projector can be imagined to have, and sent it to representative users of projectors and to all producers of projectors, with the request that they judge the importance of each of the one hundred or more characteristics. The results were discussed at a meeting jointly sponsored by the Department of Audiovisual Instruction and EPIE, at which representatives of the user group and of the producer group reviewed each characteristic. The discussion resulted in a "priority list" of the characteristics deemed important by the representatives of both groups, as well as agreement as to the necessity for supplying comparable information on similar products. The priority list makes it possible for EPIE to use producers' published information selectively in compiling information on overhead projectors and also gives producers a mechanism for reporting on new projectors. A group of school audiovisual personnel will be asked to comment on the usefulness of the descriptive chart devised on the basis of the priority list, with a view to refining the mechanism as use dictates. Plans have been laid for a similar attack on the question of describing closed circuit television equipment.

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*Research and development in these techniques were only partially supported by U.S. Office of Education funds. Other supporting agencies were the Pennsylvania Department of Public Instruction, the Institute for Educational Development, and the Universities of Florida and Illinois.

The question of priorities of information in regard to educational materials of a content nature is somehwat less complicated, since matters of precise electric and other such technical measurements do not occur. Informal discussions with several experienced science teachers have resulted in some guidelines for the initial collation of producers' descriptive information on elementary school science materials. Further such discussion and submission of the resulting lists to use tests will be necessary here also.

Developing Analyst Information

As indicated earlier, the consultants who met at the December and the April work conferences addressed themselves in detail to the question of independent analysis of instructional materials for the purpose of explicating the assumptions which underlie their preparation. At the second work conference attention was given to various approaches to such analysis, and since that time groups working at the Universities of Florida and Illinois have undertaken experimentally the development of practicable analysis techniques. Appendices D, E, and F relate in more detail the results of the work conferences and of experimental trials.

The value of the planned product analyses may go beyond their role in the selection process. While their first usefulness is perhaps to permit the school decision-maker to discover which products fit most closely the purposes, procedures, and educational philosophy which serve as his teaching framework, secondarily they may call to his attention, for instance, another approach which may add a new dimension to his program. Detailed analyses, too, should facilitate the process of integrating instruction from year to year by permitting the school to select materials which fit together. Finally, the analyses will, as a number of producers have already indicated to EPIE, be very useful in design and revision of materials.

Collecting User Information

From the beginning, EPIE has planned to include in its descriptions of products reports about user satisfaction and dissatisfaction. Many different product dimensions and conditions of product use will be taken into account in collecting the information and in reporting it to subscribers.

Reports on the performance of products in relation to specific instructional settings will be gathered separately from teachers, administrators, and students. Interview response forms will be tailored to fit these three sources. The first such form, that for teachers, has been drawn up and is currently being tested on a small group (N=40) of elementary science teachers. **(See Appendix G.)**

Interview reports will be supplemented by questionnaire and telephone survey techniques. The collection of data will for the most part be undertaken locally by school people who have had considerable experience in educational research or who have had specific instruction in EPIE information-gathering techniques at a rather extensive training session. The first such session was held between August 13 and 31, 1967, to test the training strategy. A report on that session appears as Appendix H.

In seeking balanced product performance information, EPIE must insure that it has been in touch with a directly describable sample of product users. A scheme for selecting such a sample for the first pilot study, the Four-State Cooperative Project, is attached as Appendix I.

WHERE THE EXCHANGE STANDS

The present study has yielded results which indicate that the collection, synthesis, and dissemination of educational product information is a feasible activity. There are, indeed, indications that findings incidental to the pursuit of that activity will be of interest and use to the educational field in general. Appendices J and K explicate in detail the nature and scope of the Institute's plans for research and service.

In the course of the study EPIE has established professional connections which will be invaluable to its future development. More importantly, it has evoked in a large segment of the educational community a response which in effect demands that the activity be made operational. Some, though not all, of the techniques needed to effect the collection of pertinent information have had sufficient trial to be considered final; starts have been made at least in all the necessary avenues, and comprehensive plans are laid down for continuance. The present uncertain state of funding for the Four-State Cooperative Project is the only deterrent to immediate implementation of the full-scale research program.

THE FUTURE

As the foregoing has indicated, emphasis so far in EPIE's development has been on the collection rather than the dissemination of information. Broadcast service, the first of three modes envisioned for EPIE, is possible now, and has been initiated, but not under this contract; expansion to responsive and interactive service is scheduled to take place during the proposed three-year development period, as is the addition, if it is in demand, of a "customized" service, actually tailor-made to the requester's specifications. Such developments, of course, depend upon successful trials of collection and synthesis techniques, as well as upon another aim for the future: the development of the services in such a way that they become self-supporting after a period of trial and development.

A philosophical aim of EPIE's staff is to contribute to the improvement of rather than just change in educational technology. EPIE feels a responsibility to work towards the humanistic use of the tools and the products of the increasingly technological education profession. EPIE very much hopes to develop its services in such a way as to facilitate education of individuals rather than of groups.

Appendix A

Members of the EPIE Advisory Board

American Association of Junior Colleges
American Association of School Administrators
American Association of School Librarians
American Educational Research Association
American Federation of Teachers
American Industrial Arts Association
American Institute of Architects
American Personnel and Guidance Association
American Vocational Association, Inc.
Association for Supervision and Curriculum Development
Association of Chief State School Audio-Visual Officers
Association of School Business Officials of the United States and Canada
Council of Chief State School Officers
Department of Audiovisual Instruction, NEA
Department of Classroom Teachers, NEA
Division of Educational Technology, NEA
Electronic Industries Association
International Reading Association
Library Technology Program, American Library Association
Modern Language Association of America
National Association of Biology Teachers, Inc.
National Association of Educational Broadcasters
National Association of Independent Schools, Inc.
National Association of Secondary School Principals
National Council for the Social Studies
National Council of Teachers of Mathematics
National School Boards Association, Inc.
National Science Teachers Association
National Society for Programmed Instruction
Service Center for Teachers of History, American Historical Association

Appendix B

GUIDELINES FOR DEVELOPING DESIGN AND PERFORMANCE SPECIFICATIONS FOR EPIE

Prepared For:	Educational Products Information Exchange Institute For Educational Development New York, New York
Prepared By:	Community Systems Foundation Ann Arbor, Michigan
Date Submitted:	April 28, 1967

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LONG-RANGE GOALS AND THEIR ACHIEVEMENT

In designing and implementing an information system, it is often beneficial to consider those characteristics which represent a system that fully achieves all desireable goals. In so doing, the creators of the system force themselves to state in precise terms the ultimate objectives of their work.

It is important for those who will guide EPIE's future to formulate a clear statement in operational terms of what EPIE seeks to achieve and what barriers must be overcome to do so. For EPIE will be created with the recognition that it cannot at the outset fulfill all of its goals, yet must continually progress closer to them.

For many reasons, EPIE cannot at the outset achieve all of its objectives. To do so, EPIE would have to exhibit at least the following characteristics:

1. Users of the system would have the ability to gain access to information which would always influence the attainment of a "correct" decision for product selection and application.
2. Multiple users of the system would have the ability to achieve simultaneously instantaneous access to information as frequently as desired.
3. The system would continuously experience full utilization of its resources, including personnel, plant, and information.
4. The cost of operating and maintaining the system would be zero.

Underlying the characteristics above are a number of sub-goals which would have to be met and yet cannot be at the outset.

To achieve the characteristic of "correct" information, objective measures would have to be available to determine the "correctness" of each decision arrived at by users of the EPIE system. Should a decision be judged correct on the basis of student performance using the chosen materials? On the basis of teacher's acceptance of the chosen materials? On the basis of whether or not the system user continues to use the EPIE system after a personal evaluation of the effectiveness of past use? Should it be judged correct on the basis of one, all, or a combination of these texts? Is one test more important than another? If so, how should each be weighed relative to the others? Within a test, how should terms such as "performance" and "acceptance" be scaled? Further, is student performance computed on the basis of percentile scores on standardized tests administered at the completion of a course in which the chosen materials were used, on the basis of the stature achieved in adulthood by the student in the study area, or by some other measure? How can the contributions to student performance made by the selected materials be isolated from those deriving from other materials, or from the teacher's role, or from exposure to other students?

One could continue to ask such questions, with each serving to substantiate the difficulty of determining the "correctness" of a decision. Yet in an ideal system, the meaning of "correctness" would be clear and universally accepted.

Operationally, the EPIE system can go a long way towards the isolation of those factors which appear to account for judgments as to the correctness of decisions. Statistical techniques can be applied which help to explain differences in judgments as to the correctness of a decision or the utility of a material. However, the successful use of these techniques does not rest on the ability of EPIE to attract skilled statisticians who can perform meaningful analyses of variance. Rather it rests on the ability of educators to 1) identify the factors or variables which do in fact cause the judgments of one person to vary from another and which cause the performance of one student to vary from another, 2) define these variables in operational terms which are understood and accepted by those who must use them, 3) design techniques for measuring and scaling the variables which are easily applied, acceptable to those performing the measurement and scaling, and valid with respect to possessing the sensitivity essential to achieving the explanation of variance which is inherent in the judgment being made or the performance being measured.

Months of work by leading educators in the fields of curriculum analysis and performance measurement have shown that the above capabilities do not exist today. Progress has only just begun to be achieved in the above activities. Without these capabilities, the skills of the statistician in performing analyses of variance, the results of which would be used to synthesize data in the preparation of information for use by EPIE users-decision makers, would be of little value.

To achieve the second ideal characteristic above -- instantaneous, unlimited access to information within EPIE -- several requirements would have to be met which either exceed the resources likely to be available in the near future or which cannot be achieved prior to the gaining of experience via actual operation of the system. Implicit in the ability of the system user to achieve access to information whenever desired are the requirements discussed above under the first ideal characteristic, plus the corollary characteristic of EPIE possessing the pre-requisite resources for fulfilling user demands. Fundamental to possessing such capability within EPIE is the possession of full knowledge of the demands which will be imposed upon the EPIE system, sufficiently early to permit the planning and acquisition of resources. Such knowledge would consist of demand sources, frequency of inquiry, processing time requirements (workload), user response time requirements, user location, user requirements for information display, etc.

Although survey techniques exist for forecasting demand and although EPIE has gained some knowledge as to potential sources of demand by defining a geographic pilot region, little can be done to forecast demand in the precise terms required for ideal planning and resource acquisition. Thus, EPIE must initially forego the capability of meeting all potential demand instantaneously. Rather, it will sacrifice servicing a portion of the demand, lack the capability of providing "on-demand" service, or both.

Even if EPIE could forecast total demand in the terms required, this would not be enough to achieve the ideal characteristics of instantaneous, unlimited access to information. To achieve such access to EPIE information, fully automated information management and retrieval is pre-requisite.

The fulfillment of the first ideal characteristic will ultimately create a massive amount of information requiring repetitive processing in view of specific inquiries. A highly sophisticated information system of the type ultimately envisioned will require large amounts of data to achieve acceptable statistical significance in its analyses of variance. Rather, it would also be designed to permit, when needed, the performance of such analyses. This will require the storage of large amounts of data in a form amenable to rapid search, retrieval, and manipulation, and the pre-programming of routines or rules for processing the data. Such tasks are ideally performed with the use of high-speed electronic computers, as they represent the most economical and reliable means for repetitive manipulation of large amounts of data in "random" or unpredictable combinations.

For economic reasons, automation will be required if system users are to achieve instantaneous access to information as needed. Under such conditions, the system must anticipate the presence of multiple inquiries which simultaneously require the use of one or several sets of data. Under a manual or partially automated system, this requirement could only be met by duplicating data and data processing staff in sufficient quantity to avoid the unacceptable delay of one user while another's inquiry is being processed. However, through the use of today's high speed, "time sharing" computer systems, the need to maintain duplicate sets of data and staff for inquiry processing can be eliminated. Such systems permit many users to simultaneously share one set of data and staff with the effective appearance of exclusive use.

However, the initial EPIE system is not likely to possess such capability. For one thing, it would be difficult to meet the computer programming requirements within the time and resources likely to be available. For another, the amount of data initially available, the volume of initial demand, and the complexity of the initial analysis-retrieval procedures are not likely to justify the use of computers. Also, the acquisition of the necessary computer hardware, including communication devices for use in receiving, processing, and returning the results of system user inquiries could not be achieved in the initial pilot period. Also, the training of users in how to communicate with such a system is a large task requiring the preparation of detailed instructional materials and considerable training time.

Thus, EPIE for a number of reasons cannot initially possess the characteristic of full (integrated) automation. However, this must be a major goal of the system if reliable, "personalized" information synthesis and "on-demand" service to users are to be realized. The challenge to EPIE will be to transcend from a state permitting the servicing of individual inquiries over several days, weeks, or even months to a state wherein curriculum committees and others can utilize the EPIE system "live" as they perform the tasks of educational product evaluation and selection.

Finally, the ideal system characteristics of full resource utilization and zero cost cannot be met in an operational EPIE, no matter how sophisticated the system becomes. Yet these ideal characteristics should represent goals whose achievement is constantly being sought. Full utilization of existing resources should represent a guiding principle of never acquiring resources which are idle to a substantial degree. Zero cost, in turn, should stand for the principle of cost minimization through effective organization, planning, scheduling, methods selection, and supervision.

SHORT-RUN GOALS

Although EPIE cannot achieve all of its long-range goals at the outset, it can be of service to educational decision makers in the selection of materials if it can partially fulfill these goals. The task at hand is to design a meaningful initial operational system. The term "operational system" is intended to represent a particular information system which provides limited but useable information and service, which passes the tests of economic justification and survival, which recognizes in highly specific terms how it falls short of its long-range goals, and which continuously strives to achieve them through evaluation, research, revision, and sound management.

Unquestionably, there exist as many operational systems as there are individuals or groups to design such systems. The recognition of the need to design a less than "perfect" system, creates an opportunity to design a number of systems which cannot be evaluated against benchmarks of perfect performance. It is difficult to evaluate the superiority of one "sub-optimal" design over another. As such, the operational system which EPIE will initially achieve should not be taken to represent the one and only operational system. Rather it will be a system which, hopefully will adequately meet EPIE's short-range goals, while possessing the important "ingredients" for long-range goal achievement.

Perhaps the need for creating an operational system should be stressed. From the viewpoint of those members of the education profession who have seen in EPIE a means of vastly improving the decision-making process of educational materials selection, an overriding need exists now to create an operational EPIE which will be justified as long as it provides the decision makers with better information than they now possess. To this extent, an annotated bibliography of all available materials in a particular curriculum area would represent an improvement.

However, if the system was comprised solely of the resources necessary to prepare and maintain an annotated bibliography, it would not meet the definition of an operational system as set forth, for it would not include the resources essential to carrying it closer to the long-range goals.

Those who have supported EPIE are as much committed to an initial system which has the resources to continually evaluate and upgrade itself as to one which has resources to serve users on a current basis. To this extent, the initial system --called PILOT EPIE -- should be one part service and one part research. That part which is service will in some ways be less important initially than the part which is research, for it will be created within fairly severe constraints of limited time, money, and knowledge. In the process, it will sacrifice the achievement of many of the characteristics of the long-range system, for its overriding goal will be a pragmatic one of achieving some form of useful service within a short period of time, plus effective mechanisms for evaluation and modification as necessary.

Because, the orientation of the various consultants and advisors to EPIE varies with regard to discipline, experience, working environment, and interests, no uniform opinion exists as to what should or should not be included in PILOT EPIE from a service viewpoint. Some feel a strong need to provide initially information pertaining to the content of educational materials as well as their physical characteristics and the environments in which they have been used in the past. Others feel that concern over content will prohibit creating a PILOT EPIE in the near future which provides useful information. Still others see a major need to execute some semblance of statistical analysis in order to synthesize diverse information on a product, while others either intuitively believe variance is ultimately unexplainable by such techniques or that this element of activity is not essential to providing useful information in the early stages of EPIE. Some feel that the pilot system can be designed to permit to a limited but meaningful degree the dissemination of selected information to individuals, while others doubt the practical value of such activity and even fear its consequences. The latter group would emphasize the dissemination of generalized information to large groups of school people.

However, as the consultants come to realize that PILOT EPIE is an experimental system designed to be of some service, but also designed such that mechanisms for evaluation exist which will permit continual analysis of the initial design and subsequent modification, they should come to accept the initial decisions of what will or will not be included in PILOT EPIE. As long as the decisions taken lead to a continuing system, the valid interests of all concerned will eventually be incorporated.

GENERAL SPECIFICATION GUIDELINES FOR PILOT EPIE

Introduction

From the foregoing discussion plus an exposure over many months to people concerned with creating a PILOT EPIE, a number of potential system and performance characteristics can be identified which may be helpful in guiding the initial design. These characteristics and some of the as-yet-unsolved issues subsumed in them are presented here. The intent is to suggest guidelines and alternatives for detailed design which will aid the designers, but not constrain them in the selection of specific policies or in the actual design of an operational system.

Standardized vs. Customized Information Dissemination

Two major alternative mechanisms exist for conducting the exchange of product information. The first, called "standardized" information dissemination, would consist of the simultaneous dissemination of a particular set of information to a large group of system users. The information being disseminated could be generalized conclusions contained in an analysis of a product, generalized conclusions drawn from a number of product evaluations, or merely a reprint of an evaluation which draws no general conclusions (e.g.-the results of a case study).

This dissemination would be achieved by publishing a newsletter and special papers which are available to all who are willing to pay a subscription fee. As such, the extent to which EPIE would control the dissemination of information under this approach would be limited to its ability to decide what it will publish in the newsletter. Once it makes a decision to include a particular set of information, it will cease to control to any extent who has access to the information.

Alternatively, "customized" information dissemination represents an approach which introduces controls over who gains access to information as well as what information is provided. Whereas a user under the "standardized" approach can gain access to any information selected for dissemination simply by passing the "test" of possessing a paid subscription, a user under the "customized" approach will have to pass a number of additional "tests" in order to gain access to such information. Under the "customized" approach, certain information available for dissemination may be seen by some system users but not others, while under the standardized approach all such information is seen by all system users.

It is felt that both approaches potentially have merit, although each presents problems which are not found in the other or are found to a lesser extent. The "standardized" approach recognizes the potential service to schools to be achieved in the wide-scale dissemination of knowledge about educational products. Those who support this approach believe that experiences with products can be reported on in such a way as to be of value to many schools simultaneously and without pre-screening of those who see the information.

However, it is also possible that in an attempt to keep the published information sufficiently generalized to be of interest to at least a large portion of the system users (subscribers), several effects may occur. One, the reader may not find the information to be detailed or comprehensive enough to be of specific value in choosing products for his educational environment. Two, the reader may have to read a substantial amount of information not particularly relevant to his immediate needs or interests in order to find that which is relevant. Three, the information may be sufficiently detailed to be of value to the user, but may not be presented in a format which permits him to easily extract those details of personal relevance. Four, information which is intended primarily for users with particular educational environments may unwisely influence decisions by users in different environments.

It is not known that such effects will occur, nor even hypothesized that they will. Since the information retrieval design requirements are rather simple under this approach (i.e. - set up a newsletter subscription service), it is generally agreed that it should be incorporated into PILOT EPIE for trial and evaluation.

Under the "customized" approach, the information retrieval process will be more complex and difficult to design. Two major concerns will be:

1. Extracting from the system information on only those products likely to be of immediate interest and relevance to a system user in view of:
    a. His statement of his immediate product selection interests, expressed in the form of an inquiry (e.g. - Elementary Science kits for fifth graders; an Elementary Science series, K-6)
    b. His description of the educational environment and conditions under which the products are to be used (e.g. - curricular goals, teacher types, student types, community factors, class sizes, etc.)
2. Providing the system user with product information which is organized so as to simplify as much as possible his review and analysis of the information.

The potential value of this approach over the "standardized" one is that the user will receive more concise, relevant information which is "tailor-made" to his interests and needs.

However, it is by no means proven that such an information retrieval system can be economically designed and operated, or that it is possible to achieve a more meaningful service to users in terms of providing more concise and relevant information which will lead to better decisions than can be realized with the "standardized" approach. In order to gain an objective comparison of the two approaches, the pilot study will have to incorporate both approaches to information dissemination and carry out comparative analyses based upon experience.

For EPIE to provide highly customized, exception-oriented information, it must of necessity know more about its users than it would under the standardized approach. To gain this information, it will be necessary to engage in a *dialogue* with the system users in order to ascertain important variables to be considered in synthesizing information for feedback to the inquirer. However, no conclusive agreement has been reached on just what variables must be ascertained or what techniques should be used to do so. Some feel that highly structured, catch-all questionnaires and check lists should be used. The advocates of this technique place little confidence in the ability of the inquirer to define on his own volition those variables which are important to him and feel as such he must be forcefully guided in his statements of relevant information. Others feel the inquirer should be permitted to state in his own terms and on his own volition the information (variables) of importance. The advocates of this technique fear that a highly structured information collection format has the inherent weaknesses of containing irrelevant questions and not insuring the retrieval of all relevant information. Still another "school" supports a combination or blending of these two techniques.

As to how these techniques should be invoked, some feel that written questionnaires and check lists can be made to be self-explanatory or accompanied by written instructions and thus sent and retrieved through the mail without direct, personal contact. Others feel some degree of direct contact is required to retrieve information from the inquirer and, therefore, advocate the use of telephones. Still others fear that certain important elements of the educational environment surrounding the inquirer will not be recorded if field visits (on-site) are not made in the process of gathering information, and thus advocate this approach. Still others advocate combinations of the above.

The alternative techniques to be considered and the alternative mechanisms for invoking them can be represented by the following matrix:

Collection Techniques (b) Implementation Mechanisms (Contact) (a)	Highly Structured Check-Lists & Questionnaires (b_1)	Prose Statements (b_2)	Combination of Structured vs. Prose Approach (b_3)
Written (Remote) (a)	a_1b_1	a_1b_2	a_1b_3
Telephone (Semi-Remote) (a_2)	a_2b_1	a_2b_2	a_2b_3
On-Site Visit (Direct) (a_3)	a_3b_1	a_3b_2	a_3b_3
Written & Telephone Combination (a_4)	a_4b_1	a_4b_2	a_4b_3
Written & On-Site Combination (a_5)	a_5b_1	a_5b_2	a_5b_3
Telephone & On-Site Combination (a_6)	a_6b_1	a_6b_2	a_6b_3
Written & Telephone & On-Site Combination (a_7)	a_7b_1	a_7b_2	a_7b_3

Since PILOT EPIE is as much a research function as it is a service function, it is desireable for all of the possible combinations to be tested eventually and evaluated on a comparative basis. However, practical limitations of time and money suggests that priorities be established as to which combinations are tested first, and that certain combinations receive more initial emphasis than others.

As to techniques for collecting information from evaluators of materials, it is generally agreed that written reports will be the information collection mechanism, and that structured check lists and questionnaires combined with prose statements be the collection technique.

Limited Number of Instructional Materials

It is generally agreed that PILOT EPIE must begin with a limited number of instructional materials rather than provide information on all instructional materials. This agreement has of late been made more specific by the selection of one curriculum product class -- Elementary Science --, one information transmission product class -- overhead projectors --, and one information storage product class -- overhead projectuals -- for inclusion in PILOT EPIE.

The first of these, Elementary Science, represents a curriculum area approach. That is, EPIE will develop the ability to simultaneously consider a multitude of product types within the curriculum area of Elementary Science. This will include both information storage and information transmission products. With this approach, EPIE will be able to assist inquirers who are as yet undecided as to the particular product type they wish to use in an Elementary Science course, or who are potentially interested in acquiring a mix of product types for inclusion in the curriculum.

The decision to choose Elementary Science as the first curriculum area is based upon a number of factors. As pointed out in an internal report on an IED-initiated survey of product information needs among a sample of 109 school districts,

"Reading, although topping the list in curriculum areas, was not

> chosen due to its scope and complexities, the adviseability of waiting until EPIE can cover the field more completely, and [until EPIE can] incorporate . . . the results of current research projects. The decision to concentrate first efforts on Elementary Science was urged by teacher associations and other professional groups, and justified by the questionnaire responses placing this subject area second in importance [after reading] to schools."

Further, a majority of the consultants to EPIE have expressed a strong interest in the choice of Elementary Science, particularly from the viewpoints of need, manageability, and availability of information.

The second and third product classes to be developed, overhead projectors and overhead projector materials (projectuals), were selected for reasons similar to the selection of Elementary Science. Particular reliance was placed on the recommendations of the Division of Audio-Visual Instruction of NEA (DAVI). Representatives of this group have already carried out extensive work in defining the important physical characteristics of these product types for inclusion in EPIE.

Since the pilot system will be created within limited resources and time and with the goal of providing some rather than total service, it is likely that other mechanisms will be established to limit the number of products to be included initially within the three classes. Alternative operational strategies can be created and used to determine the specific product make-up. Examples of factors upon which such strategies may be based are:

a. Product type (within chosen product classes)

b. Scope of application

c. Innovative characteristics

d. Availability (timing; for examination; for purchase)

e. Awareness of availability (by EPIE)

f. Product age

g. Pedagogical intent (explicit vs. implicit)

h. Information system storage capacity

i. Manufacturer size and mix

Via analysis and consultation with schools, the National Science Teachers Association, and the Division of Audio-Visual Instruction of the National Education Association, EPIE can continuously develop and apply specific product selection strategies as they become appropriate.

Information Sources

Information in PILOT EPIE should be a compendium of knowledge obtained from three major sources -- producers, past users, and independent analysts or researchers. Inherent in this approach is the goal of providing the inquirer with information developed by people of different perspectives, capabilities, motivations, and experiences. Further, there exists the belief that EPIE must not appear to represent a biased source of information, which it would if it appeared to favor one or two of these three legitimate sources of information. In designing and operating the system, continual attention will have to be devoted to questions of specific sources of information within the general types and to the amount of information to be collected.

The producer of each product will be expected to complete a profile of the product if he wishes to relate information other than that which can be objectively gathered and validated by EPIE staff from generally available data (e.g. - his evaluation of the teaching style most appropriate for use of the material).

The selection of past users for preparation of product evaluations becomes dependent upon such factors as product type, quantity and nature of product evaluation and variance-explanation variables, degree and sophistication of variance analysis, willingness of past users to provide evaluations,

2. For overhead projectors, acquire analyses of physical characteristics, to be performed by technicians in a "laboratory" setting. in order to qualify for active use in information retrieval. Require approval of the research-technician reports by the Product Information Advisory Committees of NSTA and DAVI. Part of the analyses of physical characteristics may be in terms not related to application environments (e.g. - actual lumens), but should also be in terms relative to application environments (e.g. - conditions under which actual lumens are effective, in terms of room lighting, room size, screen size, screen to projector distance, etc.).

3. For overhead projectual sets, acquire analyses of physical characteristics unrelated to application environment. The analyses should be performed by technicians in a "laboratory" setting.

4. Establish in cooperation with the NSTA and DAVI, policies and guidelines for the recruitment and selection of researchers. Secure the assistance of the NSTA and DAVI in recruiting, screening, and selecting researchers.

Nature and Scope of Product Information

As to what information should be contained in EPIE with respect to the three product classes, agreement has not been reached on specific items of interest. However, there appears to be concern with the information content, application environment, and physical characteristics of Elementary Science materials; with the physical characteristics and application environment of overhead projectors; and with the physical characteristics of sets of projectuals (e.g. - a transparency series vs. an individual transparency in the series). For a definition of these terms and a description and the depth of information retrieval **customization.** As such, continual effort should be devoted to the development of past user selection criteria, in close cooperation with NSTA and DAVI.

However, several guidelines are offered at this point which may help to expedite the realization of an operational system:

1. In the case of all Elementary Science products and overhead projectuals, include
    a. Evaluations by teachers who have used the product in a classroom setting
    b. Students who have used the product or been exposed to it in a formal course
    c. Curriculum design committees which have evaluated the product and selected it or recommended its selection. Evaluations of the product itself by school principals and school system administrators who have not been active in the selection of the product may not be meaningful. However, these people may be valuable sources of information about the product users-evaluators who fall under their supervision.
2. In the case of overhead projectors, include evaluations by
    a. Audio-visual personnel who have selected, operated, and maintained the projectors.
    b. Teachers who have used the projectors as a teaching aid in a classroom setting.

In the selection of researchers to provide information, the following guidelines are offered:

1. For Elementary Science products, acquire analyses of information content by logical analysts.

of a conceptual model for classifying variables which are thought to influence product selections and evaluations, see Appendix A.

In each of the above areas, the consultants are working to define the variables of importance or inclusion. It is in general agreed that PILOT EPIE will initially permit a limited number of variables to be actively used in the performance of information synthesis, while others will play a more "passive" role in that they will be utilized for data collection and research, but not for information synthesis. It is also believed that a system of customized information dissemination should permit the user to declare those variables which are important, and to weigh variables himself in terms of their relative importance. Since, however, the information search and synthesis heuristics are not defined at this point in time, it is not yet clear that a strong need exists to actually utilize knowledge of user variable preferences and weights.

Regardless of which specific variables are chosen for inclusion in the information system, each will be used in the context of one or more of the following categories:

Producers

- General Descriptive Information (Factual)
- Recommended and Not-Recommended Usage Information (Evaluations)
- History of Development

Past Users

- Recommended and Not-Recommended Usage Information (Evaluations)
- Description of Evaluator-Evaluation Environment Information

Researchers

- Recommended Usage Information (Evaluation)
- Testing Information (Physical Characteristics Evaluation)
- Description of Evaluator-Evaluation Environment Information

No Product Samples

It is generally agreed that PILOT EPIE should not provide users with "hard copies" of products in which they are or may be interested. It is felt that many problems would arise if such service were attempted, not the least of which would be the high cost to EPIE of procuring samples of the products included in the system.

ADDITIONAL SPECIFICATION GUIDELINES FOR CUSTOMIZED SERVICE

Introduction

As indicated earlier, one part of PILOT EPIE should be the development, testing, and evaluation of what has been termed "customized" information dissemination. To aid the system designers, some additional guidelines are offered in this section which relate specifically to this portion of PILOT EPIE, called "customized EPIE".

Limitation of System Usage

Just as the information in the system initially should be limited to specific classes of materials, so, too, the use of the customized portion of EPIE should be limited at the outset. Steps to define this limitation which have been taken so far are 1) the decision to restrict system users or inquirers to participating (paid) members who directly exercise or influence the decision-making process of evaluating and selecting materials, (excludes producers) and 2) the decision to restrict inquirers to individuals or groups meeting the above criterion whose school systems are within the geographic boundaries identified by those of the ERIE and RBS regional educational laboratories (Delaware, New Jersey, New York, Pennsylvania).

However, the planning of resources to service users cannot be effectively made without more explicit knowledge as to the demand on the system.

Within the bounds of the user set currently defined, additional definition of demand will have to be performed which seeks to protect the economic solvency of EPIE and the desire of school systems within the four states to utilize customized EPIE.

The selection of resources based upon demand forecasting is dependent upon the following factors:

1. Number of inquiries
2. Frequency (spacing) of inquiries
3. Inquiry service time
4. Inquiry response time requirement
5. Inquiry acceptability incidence

No steps have been taken as yet to forecast the values of the above demand factors and their effects upon resource requirements. A survey of potential system users may be helpful in developing some feeling for the values of the above factors. However, such a survey would probably not be extremely helpful because of the uniqueness of customized EPIE and the low probability of potential users being able to predict their usage.

The alternative is to define EPIE's resources by estimating what may be reasonable values for the demand factors. This process could become extremely complex if in-depth consideration is to be devoted to predicting such values as the distribution of service times based upon analysis of inquiry acceptability incidence; inquiry source, type, and product module relation distribution; need for repetitive dialogue, etc. In the belief that such in-depth analysis would be of little value and accuracy initially, it is suggested that the analysis be limited to producing the following specifications for computing initial (first year) resource requirements:

1. Percentage of the school systems within the ERIE and RBS regional

laboratories which will submit inquiries.

2. The average number of inquiries per school system submitting inquiries.
3. The percentage of inquiries submitted which will fail to qualify for processing.
4. The distribution of inquiries by month of receipt and month response due.
5. The average time required to service an accepted inquiry, including time for information collection, inquiry processing, and report preparation (excluding general supervision).
6. The average time required to determine the unacceptability of an unacceptable inquiry.

Once inquiry-serving resources are acquired as a result of this analysis, they will represent limitations on the ability of PILOT EPIE to service customized demand. For the nature of the resources (e.g. - personnel, equipment) will limit the ability of EPIE to respond in the short run to unanticipated demand volumes. No such constraint will exist for the standardized information dissemination portion of PILOT EPIE, for varying demand (within reasonable limits) can be met by altering the number of copies printed of publications.

Limitations on Product Information Utilization

It is suggested that policies be created which initially limit customized EPIE's ability and willingness to provide information on products within the selected areas. Several such policies which may be useful are presented below:

1. Minimum Product Information Unit

First, the smallest product information unit within customized EPIE should be a purchaseable item. For example, if the materials within a series can only be purchased by buying the entire series, product information should be retrieved for the series as a whole rather than for selected components. This is not meant to imply that information about various components of the series should not be available from producer's profiles, user reports, etc.. Rather, the information retrieval system should be geared towards the efficient retrieval of all information on a purchaseable product provided by a particular source. Further, the providers of information will be expected to relate their evaluations and reports to the total purchaseable item.

2. Minimum Number of Reports

Second, customized EPIE should establish "lower thresholds" on the number of reports from a particular source type on a particular product which must be available before synthesized information on the product, which draws from reports submitted by the given source type, will be provided. For example, synthesized information which draws upon reports submitted by a particular type of past user of a particular product should not be used unless a specified minimum number of reports on the product have been received from that type of past user. This policy is particularly necessary given customized EPIE's limited initial ability to carry out statistical analyses of comparative information in which the effects or limitations of sample size would "automatically" be accounted for.

This policy will not restrict customized EPIE from providing information on products for which a sufficient number of reports exist from one or more source types. For example, if the lower threshold on reports from information analysis specialists (i.e. - logical analysts) has been met, but that for reports from a particular type of past user has not, the information from the analysts would be used in processing the inquiry, but that from the past users would not. As a sufficient number of additional past user reports are acquired to overcome the lower threshold, the total supply of past user reports would be "activated" for inquiry processing. In this way, the inquirer will be protected from receiving synthesized information which is unsupported by a reasonable amount of detailed information. At the same time, customized EPIE will not be restricted from considering a product when processing inquiries until sufficient information on the product is available from all three of the major source types.

3. Minimum Potential Expenditure

Third, customized EPIE should seek to achieve economical utilization of its limited initial resources by requiring a minimum potential expenditure to be associated with an inquiry before the inquiry will be processed. This can be achieved by establishing a formula which takes into account the unit cost of the product (or a "typical" unit cost in the case of multiple items within a product type), the quantity being considered for purchase, and the source of the inquiry (e.g. - a county school district vs. an individual school). The latter factor is intended to represent the probable extent to which the purchase would utilize the total educational products budget of the education unit represented by the inquirer.

The formula should be created with the goal of avoiding the use of EPIE's initial resources in processing inquiries which represent a very small percentage of the products budget under the control or influence of the inquirer. Thus, whereas a teacher may be permitted to submit an inquiry relating to a potential expenditure of $25, a superintendent of a county school district may have the same inquiry rejected.

This policy is analogous to advising a large business not to hire a management consultant in order to save $1000 by solving an operating problem. However, it also recognizes that there are different sizes of businesses, and that saving $1000 may be extremely worthwhile for some of the smaller ones. Since there will always be a cost associated with the use of customized EPIE's time and resources, and since the time and resources required to process an inquiry will not be directly proportional to the amount of potential product expenditure underlying the inquiry, this policy is believed necessary for the maintainance of a reasonable charging structure.

4. General Information Content Retrieval

Fourth, customized EPIE should initially operate under a policy of general rather than highly specific retrieval on the subject matter portion of the information content of a product. For example, a general science text may contain a chapter which discusses the science of meteorology. Within the chapter, alternative methods of forecasting the weather may be presented, with one such method being probabilistic forecasting. Customized EPIE should not index initially the contents at the "alternative forecasting methods" level, but rather at the "meteorology" level. As in an earlier example, this doesn't mean that one or more reports from past users of the text may not have commented on or evaluated the treatment of probabilistic weather forecasting. What is implied is that the normal search and retrieval methods of customized EPIE will not permit selective searching for science texts dealing with probabilistic weather forecasting.

The normal procedures may lead to the retrieval of the names of a number of texts which discuss the science of meteorology. A policy should be established to determine whether additional EPIE staff time should be expended to "hand search" (i.e. - scan) the selected texts to determine if one or more discuss probabilistic weather forecasting, or whether this task should be left to the inquirer. Since past user reports will be available on the selected texts, the possibility still exists that a review of these reports will produce information on a particular text's treatment of probabilistic weather forecasting, if the evaluator chose to highlight that portion of the content. At this point, however, such detailed information retrieval becomes coincidental rather than planned.

If additional EPIE staff time is expended on "hand searching", a policy should also be available for determining whether additional user charges are to be assessed, either in the form of monetary charges or time charges to be applied against the users "account balance" of available time.

5. Product Selection vs. Non-Product Selection Information

It is suggested that customized EPIE should organize its information into two major retrieval categories: product selection information and non-product selection information. Product selection information is that which should be available for use in deriving a selected list of products to be reported on in response to inquiries. Once a selected number of products have been chosen for reporting, the non-product selection information on those products should be used for abstracting or direct reporting to the inquirer.

Often, the non-product selection information will represent a deeper dimension of a particular class of product selection information. For example, whereas the product selection information may include author's name, the non-product selection information may include information on the author's background, his affiliations, etc.

Non-product selection information should also include information which the designers of EPIE feel is not likely to be required or logically used to develop a list of selected products most likely to be of interest and value to inquirers. For example, whether or not the author of a text received financial support for writing the text may not be expected to be important in developing a selected list of products.

The distinction is important, in that different information storage and retrieval techniques (e.g. - equipment, coding, storage media) will probably be required for product selection and non-product selection information.

Nature and Scope of Information By Inquirers

The information to be retrieved from inquirers should conform to that provided by evaluators. Just as producers should provide information about the cost of products, the inquirer should be expected to state how much he is willing to spend, if he has a limited budget and it would be of little value to report in detail on products he cannot afford. Likewise, the success of the product selection process will be dependent upon his ability to state his requirements, preferences, and application conditions in terms conforming to those in which products have been evaluated. The extent to which he does this will influence EPIE's ability to provide synthesized information on products likely to be found of value.

It is likely that all inquirers will not respond initially with equal scope and attention to EPIE's requests for information. Thus, it will be necessary to have policies to determine if sufficient information has been obtained from inquirers to provide a meaningful service. Some guidelines for initial formulation of such policies are offered below.

1. If a "pass" of the product selection information using the information provided by the inquirer fails to yield a minimum proportion of the total products potentially reportable, require the inquirer to assign priorities on the information he has provided. Beginning with the lowest priority information, remove information from consideration in additional passes until the above requirement is met. Once the requirement is met, determine how the

"values" of the deleted information for the selected products differs from the "values" initially specified and report the differences to the inquirer. The total products potentially reportable is the sum of the products in the EPIE system within the product type if specified by the user, or the sum of all products within EPIE and the appropriate product module if unspecified.

2. If a pass of the product selection information using the information provided by the inquirer fails to yield a maximum proportion of the total products potentially reportable, require the inquirer to submit additional information if he has not completely responded to EPIE's request for information, or if he has responded in terms uninterpretable by EPIE. Invoke this requirement until such time as the above requirement is met, or until EPIE feels all information has been provided, or until the inquirer declares himself unable or unwilling to provide additional information. If all information has been provided or if the above requirement has been met, proceed normally. Otherwise, response to the inquiry should be limited to reporting the descriptive (factual) information on the products selected with the available information, with no evaluative information to be provided.

Flexible Information Retrieval

It is suggested that customized EPIE should be designed to create a highly flexible information retrieval system. The system should be flexible in the sense that it should be capable of efficiently handling via normal retrieval procedures diverse inquiries of high frequency.

For example, customized EPIE anticipates receiving frequent inquiries on the use of Elementary Science kits, without reference to specific ones. It should, therefore, have a retrieval system which will permit the consideration of all kits, in the sense that the search and selection process should begin with the "universe" of information on available kits within the EPIE system. Conversely, EPIE also anticipates the receipt of inquiries relating to a specific type of kit (e.g. - a botany kit), or even a particular manufacturer's kit. As such, it should also be able to efficiently cull from the information file only that information which pertains to the particular "subset" of the kit "universe" of interest.

Further, just as customized EPIE should be able to "slice the information pie" by product, so, too, it should be able to do so by curriculum and by information source (i.e. - producers, past users, researchers). To achieve this flexibility -- regardless of the use of automated equipment -- will require the careful design of indexing procedures and coding schemes. Design guidelines for achieving such flexibility will be offered in a later section.

Adaptive Information Retrieval

In addition to designing an information retrieval system which is flexible in the sense described above, the system should also be adaptive in two ways.

First, recalling the earlier discussion of product selection vs. non-product selection information, an efficient system will probably employ different techniques for classifying and handling these two types of information. Information considered as non-product selection will probably be encoded in limited ways, whereas product selection information will probably be highly encoded. Also, normal search procedures of product selection information may entail some use of electronic data handling equipment, such as sorters, collators, or computers, and manually operated coordinate indexing systems (e.g. - Peek-A-Boo system), whereas non-product selection information search procedures may be constrained by standard classification indexing systems designed to organize written material stored in filing cabinets.

The design, however, must be prepared to respond to experience in using the system. This may lead to the recognition that information which was initially designated for use in product selection is best reclassified as non-product selection, or vice versa. As this occurs, mechanisms must exist for altering the way in which a particular set of information is treated with respect to coding, location, and applicable search procedures.

Second, the system must also be adaptive in the sense that information can be added to or deleted from the system without necessitating the revision of indexing procedures, the redesign of coding formats, the refiling of information, etc. In those instances where standard classification systems are used such as sequential coding (i.e. - information coded and then filed in numeric or alphabetic order), the adaptability design criteria will require projections to be made as to the amount of space, number of columns, number of unassigned positions, etc. which must be planned for in order to permit growth without redesign or reassembly.

Alternatively, coordinate indexing systems usually permit a greater degree of growth allowance without redesign than do standard classification systems, and with less need for attention to planning growth allowances. Usually inherent in one card of a Peek-A-Boo system are many unused or unassigned locations which represent a growth allowance. Further, as one desires to expand the depth of indexing information (e.g. - incorporating into the retrieval system the "probabilistic weather forecasting" level), this can be easily done in a coordinate indexing system by adding more Peek-A-Boo cards to the existing deck, whereas such expansion under a standard classification system may require the redesign and refabrication of a substantial portion of the information retrieval system. For example, if the standard classification system is superimposed upon a punched card operation, all cards will have to be repunched if sufficient unused columns do not exist to permit the lengthening of a code number.

Conversely, if it becomes desireable to delete certain information from the system, a standard classification system may require revision if failure to do so leads to excessive unused positions, columns, file space, etc., or excessive manipulation of "dead" information. A coordinate indexing system can be designed so that the procedures for using it automatically exclude from manipulation or consideration "dead" information. Since, however, advantages of higher processing speed and error checking may be inherent in certain standard classification systems, the initial design may be a blend of the two main forms of information organization to achieve the advantages of each.

Product Selection Information System Design Criteria

The above section discusses alternative information organization schemes for purposes of storage and retrieval of product selection information. In particular, standard classification systems and coordinate indexing systems are briefly discussed as to their relative advantages and disadvantages.

At this point in time, two approaches to the design of an initial product selection information system are considered feasible in light of potential demand and resources. It is suggested that these two alternatives be explored in depth by EPIE's information retrieval system design group. One is a pure coordinate indexing system operated manually, the other is a combined standard classification-coordinated indexing system operated mechanically through the use of punched card equipment. As the major guiding principle for the exploration of these two alternatives, it is recommended that both systems be designed such that they possess equal flexibility and adaptability. Specifically, flexibility and adaptability should be equal in terms of ability to:

1. Add or delete products from the system.
2. Carry out product selection search and retrieval on equally detailed levels describing the source of evaluations.
3. Carry out product selection search and retrieval at the evaluator descriptive level specified by the inquirer or essential to achieving a list of selected products according to the policies recommended.
4. Carry out product selection search and retrieval on equally detailed levels of evaluation.

Although a coordinate indexing system is inherently more adaptable than the standard classification portion of a punched card standard classification-coordinate indexing system when it comes to expanding the number of categories within a particular information type and level, the latter should be considered sufficiently adaptable if it is apparent that the number of categories which can be achieved surpasses any reasonable estimate of the maximum number likely to be required. For example, within the information type and level of "teacher subject matter competence" (e.g. - "products recommended by producers for teachers of 'average' subject matter competence", or "teachers of 'average' subject matter competence recommended these products for use with students whose attitude towards the subject matter is 'mildly interested'"), if five categories of "teacher subject matter competence" are established initially and two columns are designated on a punched card for recording "teacher subject matter competence" in numerically coded form, allowance exists for recording up to 99 different categories. Even though the coordinate indexing approach is more adaptable in that more than 99 categories of "teacher subject matter" competence can be incorporated without redesign or alteration of other Peek-A-Boo cards, while the designation of the 100th category would require a third column on the punched card which may already be in use, the latter should be considered equally adaptable in practical terms.

In exploring the two alternative approaches, the relative advantages and disadvantages of each should be considered as follows, given the above design criteria which "normalize" other inherent advantages or disadvantages:

System Type	Advantages	Disadvantages
Pure Coord. Index, Manually Operated	1. Less need to predict maximum number of categories within an information type and level. 2. Search procedures very simple. 3. Less costly and time consuming to design. 4. Less capital expenditure. 5. Requires less skilled system operators.	1. Search and selection relatively slow. 2. Probability of selection errors higher. 3. Potentially more direct labor expenditure.
Combined Coord. Index. Standard Classification, Machine Operated	1. Potentially faster search and selection. 2. Probability of selection errors lower. 3. Potentially less direct labor.	1. Potentially excessive redundancy in card handling (i.e. - sorting, stacking, collating, refiling, etc.) 2. Greater capital expenditure 3. Need for higher skilled system operators. 4. More costly and time-consuming to design. 5. Search and selection procedures more complex.

The major challenge in designing a mechanized combined system is felt to be the design of efficient search, selection, and refiling procedures which will avoid excessive card handling. Too many punched card systems which are ostensibly more efficient than manual systems lose whatever advantage they may have by incorporating poorly designed search and selection procedures. As to achieving acceptable design flexibility and adaptability, initial efforts indicate this can be accomplished. For a description of a punched card combined coordinate indexing - standard classification product selection information system, see Appendix D.

Synthesis Procedure Criteria

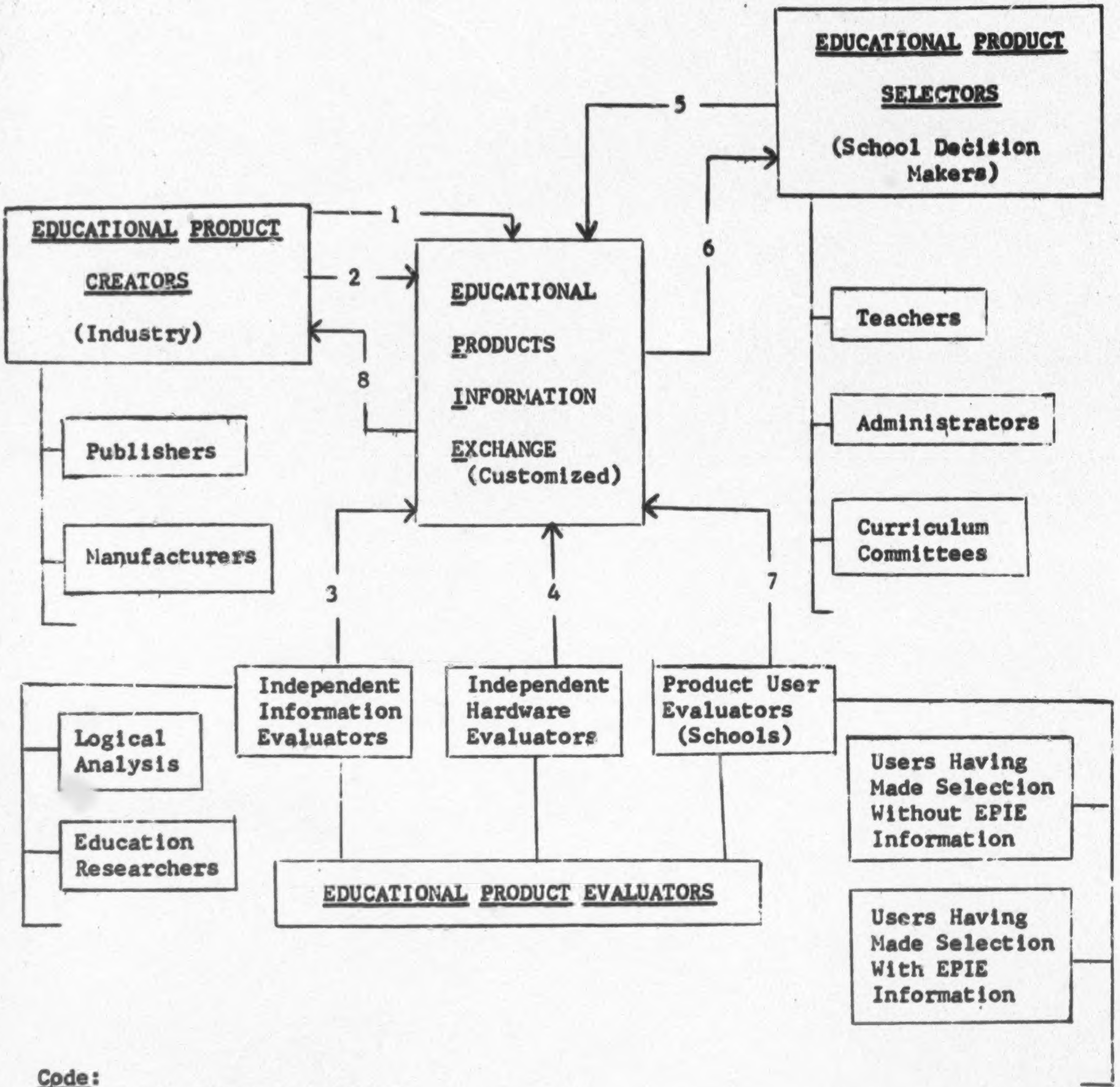
As mentioned earlier, once the product selection information system has produced a selected number of products for inclusion in an inquiry response, the non-product selection information system should be activated to prepare the actual response. To assist in the creation of detailed design specifications for this portion of customized EPIE, the following guidelines are offered:

1. Reports should inform the inquirer of the extent to which the products selected conform to the analysis specifications which he provided.
2. Products selected on the basis of past user evaluations should be supported by information describing the past users (e.g. - description, number of reports on file, etc.)
3. Reports should inform the inquirer of the values of those "recommended usage" variables not specified by the inquirer for use in product selection.
4. The system should incorporate efficient procedures for searching and updating information. This may require the use of punched card equipment for periodic updating of summary data.

Major Information Flow Channels

In previous sections, sources of information and types of reports for customized EPIE have been discussed in various contexts and examples. At this point, it is desireable to state in a compact and simple manner the probable sources and receivers of information, plus how the information will flow. The relationships between information sources and flow are represented in the following flow diagram of inputs and outputs:

SIMPLIFIED FLOW DIAGRAM -- CUSTOMIZED EPIE


EDUCATIONAL PRODUCT SELECTORS
(School Decision Makers)
EDUCATIONAL PRODUCT CREATORS
(Industry)
EDUCATIONAL PRODUCTS INFORMATION EXCHANGE
(Customized)
Teachers
Administrators
Curriculum Committees
Publishers
Manufacturers
Independent Information Evaluators
Independent Hardware Evaluators
Product User Evaluators
(Schools)
Logical Analysis
Education Researchers
Users Having Made Selection Without EPIE Information
Users Having Made Selection With EPIE Information
EDUCATIONAL PRODUCT EVALUATORS
1
2
3
4
5
6
7
8

Code:
1 - Intended Product Utility
2 - Product Specifications
3 - Analysis of Information (Logical Analysis)
4 - Analysis of Physical Specifications (Lab Technicians)
5 - Product Information Inquiry
6 - Response to Product Information Inquiry
7 - Product Application Evaluation (Performance)
8 - Product Application Evaluation (Synopsis)

The total information flow between members of the system is not represented in this diagram, as certain informal direct communication lines will probably exist (e.g. - industry↔schools). Rather, the diagram represents the major or formal communication links which are probably essential to the performance of EPIE's functions.

The diagram also does not convey all feedback and self-evaluation processes which will hopefully ensue. In particular, EPIE will seek feedback from users of the system as to their satisfaction with its services, the extent to which it has contributed to improved product selection, and its needs for modification and improvement.

Finally, the diagram does not convey the process of iterative dialogue which is likely to ensue between customized EPIE and its users in the processing of inquiries. As customized EPIE finds that initial dialogues do not produce sufficient information to permit useful synthesis of the product information it maintains, or as inquirers find that initial responses to inquiries do not provide sufficiently precise and useful information to make decisions, additional dialogue will hopefully ensue. Particularly at the outset of customized EPIE, such iterative dialogue should be dominant. Over time, however, as customized EPIE improves its knowledge of information which it must obtain from inquirers to perform meaningful retrieval and synthesis, its techniques for soliciting such information, its statistical analysis capabilities, and its information base, and as system users learn how to precisely state inquiries and collect information using uniform techniques, the need for such repetitive dialogue should diminish.

GROWTH CHARACTERISTICS OF PILOT EPIE

Since PILOT EPIE is intended as an initial operating system which will continuously move closer to achieving its long-range objectives, its designers

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must be concerned with defining specific ways in which it can and should grow.

Continuous Evolution

The most important growth policy to be stated is the concept of continuous evolution. The goal of the system designers should not be the creation of a pilot system which will operate intact for a pre-specified time period, finally to be replaced by a "new model." Rather, it should be to create a flexible, adaptable system which possesses sufficient resources to generate improvement and expansion on a continual basis. In an earlier section, the criteria of flexibility and adaptability as they apply to PILOT EPIE were more fully explored.

To some extent, however, time is bound to become a dominant factor in regulating the evolution of EPIE. To maintain the interest of schools and industry, EPIE must be committed to evidencing growth at least once yearly. In the fall of each year, as schools begin to consider educational product needs for the following academic year, hopefully, those who have used EPIE the previous year can continue to do so in new curriculum-product areas. Those who have not been able to use EPIE in previous years will also, hopefully, seek service in current curriculum-product areas.

Further, the process of feedback from schools and that of self-evaluation which EPIE plans to carry out, although continuous, will in part be time-regulated. There is an inherent time lag between an EPIE-influenced decision and an evaluation of the decision, its effect upon the educational process, and the product chosen. Typically, a decision reached in the winter of one year to implement a product does not come "full cycle" until the summer of the following year, creating a time lag of approximately fifteen months. Product application evaluations from users of EPIE cannot, therefore, be used to update the information files and retrieval procedures until fifteen months subsequent to a product selection decision. PILOT EPIE will become at least partially time-dependent by necessity as well as by design.

Modular Growth

Within the growth concept of continuous evolution is that of modular growth. For although EPIE must evolve continuously, it must also seek some structure to its evolution. The concept of modularity is that EPIE should expand by defining new major classes of products along product type and curriculum lines as growth units. Just as EPIE has decided to begin with the modules of Elementary Science and overhead projectors-projectuals, in the future it must select for development new product modules such as Social Science and closed circuit television-video tapes.

The reasons for this approach are two-fold. First, from the viewpoint of EPIE and its developers, any approach other than the selection of an educational product area in its entirety would be both chaotic to manage and of disservice to system users. Second, from the viewpoint of the users of EPIE and its information sources, an approach which dealt with only a segment of a product area could create an image of EPIE being a system with inherent bias and thus threaten its credibility and survival.

Professional Association Relationships

Thus, EPIE seeks to develop information "packages." It is doing so by establishing formal relationships with professional educational associations which are particularly concerned with a product module and willing to provide guidance in its development. The relationships it has established with the National Science Teachers Association (NSTA) for the Elementary Science module and with the Division of Audio-Visual Instruction (DAVI) of the National Education Association (NEA) for the overhead projectors-projectuals module are considered instrumental in the full, objective, and competent development of the modules and in the preservation of EPIE's image as an organization dedicated to the fair representation of all interests. As EPIE seeks to develop new modules in the future, it should concurrently seek the establishment of formal relationships with appropriate professional associations.

Qualitative Growth

It is hoped that EPIE will grow along qualitative as well as quantitative lines. Particularly within the areas of automation, depth of information indexing, statistical analysis, and information retrieval techniques, EPIE should continuously seek to improve itself and its service within existing product modules. As stated earlier, the success of EPIE will also be dependent upon its ability to develop meaningful, acceptable, and consistent instruments for evaluating products and their performance.

User Boundary Expansion

Finally, EPIE should expand the boundaries of its user "universe" by increasing its resources such that school users within the current geographic boundaries and without can utilize customized EPIE either for the first time or more frequently. EPIE also should seek the day when it has sufficient resources to permit individuals or groups other than school personnel, such as publishers and manufacturers, to submit inquiries.

IMPLEMENTATION REQUIREMENTS AND RESPONSIBILITIES FOR CUSTOMIZED EPIE

Since the major purpose of this paper is the presentation of guidelines for developing design and performance specifications for PILOT EPIE, intensive effort has not been devoted to an in-depth analysis of implementation requirements. Further, cost estimates for developing, implementing, and operating PILOT EPIE are not offered here, although assistance has been provided with the development of a budget for PILOT EPIE, as presented in the proposal to which this paper is an addendum. However, the major implementation activities to be performed in the development of customized EPIE are listed for purposes of documenting the areas which will probably require further exploration and planning.

The activities to be carried out are suggested as follows:

1. Acquire the product information which will be stored in customized EPIE (also information base for standardized EPIE). This will require the selection of actual products for inclusion in PILOT EPIE; the preparation of evaluation-performance reports by producers, past users, and researchers; and the collection of information by EPIE staff. Also, pre-requisite to the development of product reports is the determination of specific information requirements, value scales, evaluation-measurement methodologies, and data collection instruments.
2. Determine the appropriateness of the guidelines for developing design and performance specifications set forth in this paper and modify as necessary. On the basis of the final guidelines, develop operating policies as indicated.
3. Within the approved guidelines and operating policies, develop the information storage and retrieval systems to a level sufficient to achieve operational status. The major areas of activity for the information storage and retrieval design group are thought to be as follows:
    a. Indexing-filing methods.
    b. Information organization.
    c. Coding procedures.
    d. Information handling procedures.
    e. Synthesis decision rules.
    f. Forms design.
    g. Controls design.
    h. Training for system operation.
    i. Demand forecasting.
4. Based upon the outcomes of the detailed information storage and retrieval design, determine requirements for housing, equipment, supplies, and personnel.

5. Acquire and train necessary personnel. Principally, these would be people engaged in the preparation of product evaluations (e.g. - logical analysts, student interviewers) and in the operation of the customized information system.

6. Conduct additional promotion of potential system users via progress reports published in standardized EPIE and via seminars. Develop and engage in an educational-training program on the value of customized EPIE and how it is used.

7. Carry out a trial run of the initial operating system for customized EPIE for purposes of testing and refinement.

As to implementation responsibilities beyond general administration, it is suggested that full-time systems engineers be acquired and designated as the Information Storage and Retrieval Systems Design Group, with responsibility for performing the detailed design work as set forth in step #3 above. In addition, this group should have responsibility for the analytical activities to be performed under steps #2, 4, and 7 above. Analytical responsibility for steps #1, 5, and 6 should rest with other staff, to be designated the Information Acquisition Group. The two staff groups should work in close cooperation, as their activities are inter-related and inter-dependent. In a very real sense, the success of PILOT EPIE will hinge on the ability of its administrators to effectively coordinate the work of these two key staff groups.

APPENDIX A

Product Evaluation Conceptual Model

A major issue being faced at this stage in the development of EPIE is the selection of variables for inclusion and operation within customized EPIE. This process has been assisted to date by the development of a conceptual model for classifying variables which are thought to influence product evaluations. In the belief that this conceptual model will continue to serve as a device for logically grouping variables, its basic elements are herein described.

The conceptual model is built upon the assumption that evaluators of a product will differ in their evaluations and that these differences can be explained or accounted for by identifying various causes of the differences and the effects of each cause. If this is true, EPIE as an information system will gain perhaps the most important capability of all -- the ability to predict how a given product will be perceived to fair in a given "situation". For by identifying the "situation" surrounding a particular inquiry in terms compatable with the definition of "situations" surrounding existing or historical product applications, EPIE will be able to "match" inquiries to products so as to identify either those products likely to gain acceptance and success in the inquiry "situation" or those products which may not and the reasons why. The extent to which EPIE can function in this manner will directly influence its effectiveness and image as an objective source of information, acting in a "staff" capacity to the "line" decision maker.

The relationship envisioned is not unlike that of the guidance counsellor to the student. Just as the effective guidance counsellor enhances the quality of the students decisions on future academic and professional endeavors by clarifying alternatives, providing information, and by assisting the student in learning how to evaluate potential courses of action, so, too, EPIE in its most effective form will serve as a source of pragmatic information displayed in forms amenable to administrative evaluation, and as a "guidance counsellor" in improving decision-making skills.

Four basic classes of variables have been chosen to represent the "situation" or causes of differences in evaluation. These are physical characteristic variables, information content variables, environmental application or interaction variables, and evaluator variables.

Physical characteristic variables are those variables which describe the physical characteristics of the product -- its weight, dimensions, type of print, use of colors, tensile strength, etc., depending upon the product. Such variables can account for different product evaluations. For example, if 100 past users of an overhead projector applied the projector in identical situations, with the one exception of 70 users being right handed and 30 being left handed, and the 70 right handed users all evaluated the projector as "excellent" while the 30 left handed users all evaluated the projector as "fair" (using the same evaluation procedure), one may suspect that a physical characteristic accounted for the different evaluations. If upon examination the projector was found to be constructed with the switch panel on the right side, one may intuitively conclude that the location of the switch panel was the "situation" variable accounting for the different evaluations. Further, using statistical techniques, one could both quantitatively represent the relationship between this variable and the evaluation and forecast the probability of a future left handed user, operating in a "situation" identical in every respect to the "sample" left handed users, finding the projector "fair" by the same evaluation procedure.

In the case of information transmission products, such as projectors, blackboards, television sets, audio sets, etc., physical characteristics probably become a dominant factor in evaluations. However, in the case of products which are primarily of an information storage nature, such as maps, textbooks, audio tapes, video tapes, transparencies, slides, etc., one would suggest that the information content of the product itself would strongly influence the evaluation. Thus, a second major class of variables exists to describe the situation -- the information content variables. These variables would describe what information is contained in a particular product, both explicit and implicit. That is, a product may contain an historical account of the Civil War, but "beneath the surface" may also be the author's expression of his views on the injustices done to Negroes in the United States and on the responsibilities of a Federal Government in matters of civil rights. In this case, a set of evaluators may arrive at differences of opinion about the product based upon their satisfaction with the information presented.

This class of variables would include those which describe how information is presented as well as what is presented. Many educators feel the method and quality of presentation can influence a product's acceptability as much as what it says. For example, an evaluation may show that highly accurate pedagogical information has been presented in a style of writing which is awkward, that the author's vocabulary exceeds the level which student users of the material can be expected to possess, and that the grammatical structure is filled with errors. Such an analysis would undoubtedly influence an evaluation of the material. Following the concept of explaining differences in evaluation, another evaluation by an evaluator identical in every measureable respect to the first may find the style, vocabulary, and grammatical structure of the material perfectly acceptable, and as such differ in his evaluation from that of the first evaluator. In this case, one would conclude that the "how presented" information variables explained the differences in evaluation.

It must also be remembered that all information storage products are themselves physical entities and as such have physical characteristics as do information transmission products. Thus, causes of differences in evaluation

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may lay in the physical characteristics of a product as well as the information characteristics. No clearer example could exist to demonstrate the continuing importance of physical characteristics in evaluating products which are primarily of the information storage type than that of the highly educational film which continuously breaks when in use because inferior materials were used in its manufacture.

Yet these variables alone may not account for all differences in product evaluations. Another factor thought to be of major contributory importance in differing product evaluations is the evaluator himself. As EPIE anticipates the evaluation of individual products by more than one person, it must be aware of the "bias" or differences attributable to the evaluators themselves. Major differences in motivation, experience, intellectual levels, and analytical skills are expected to exist between the three major groups of evaluators -- producers, product users, and researchers or analytic specialists. Even within one of these major groups further differences are also anticipated, particularly in the product user class. Comprised of teachers of different educational and sociological backgrounds, principals, purchasing agents, superintendents, curriculum specialists, and students, this group is expected to produce evaluations which differ at least in part because of evaluator (as opposed to material) characteristics. Thus, any information system which attempts to explain differences in evaluation must anticipate the possibility of evaluator effect or "noise".

In some instances, the evaluator may simultaneously be a direct user of the material in an instructional setting, as in the case of a teacher or a student. When this occurs, it is felt by leading educators that characteristics of the teachers and students themselves will effect not only the evaluation of products, but the academic performance of students under their usage. Thus, intertwined in the evaluation process and effecting its outcomes, are teacher and student characteristics, either because they perform the evaluation, or because they are a part of the setting in which the product being evaluated was used. In the latter case, the effects they impose upon differences in evaluations are classed as environmental application or interaction variables.

Specifically, such factors as the teacher knowledge of subject, his self-pedagogical image, his methodology of teaching, his experience, the student's sociological-cultural-economic background, the student's apptitude and experiences, etc. are thought to be variables of significance in terms of the performance and evaluation of educational materials. In addition, other variables for possible inclusion in the environmental application or interaction class are those which depict the environment surrounding the teacher and student, such as community structure and policy, physical plant, the educational institutions attitudes towards and experience with "innovative" instructional materials (e.g. kits, television), and the classroom size.

Within this class of variables, the particular ones of importance and the "scope" implicit in them will depend upon the products being considered and the questions being asked. For example, an inquiry directed towards the acquisition of instructional material to supplement a curriculum in sex education would probably generate the consideration of "community attitude towards sex education" as an interaction variable of importance. On the other hand, an inquiry directed towards the acquisition of overhead projectors for multi-curriculum application may require the inquirer to provide EPIE with information on the location of projectors in relation to the projection screen (distance), the size of the screen, and the room lighting conditions, in order to search for projectors which are intended for use under the stated interaction conditions or which have been used under like interaction conditions. Thus, environmental application or interaction variables are those variables which in some manner correlate the educational product with the educational environment in which it has been,

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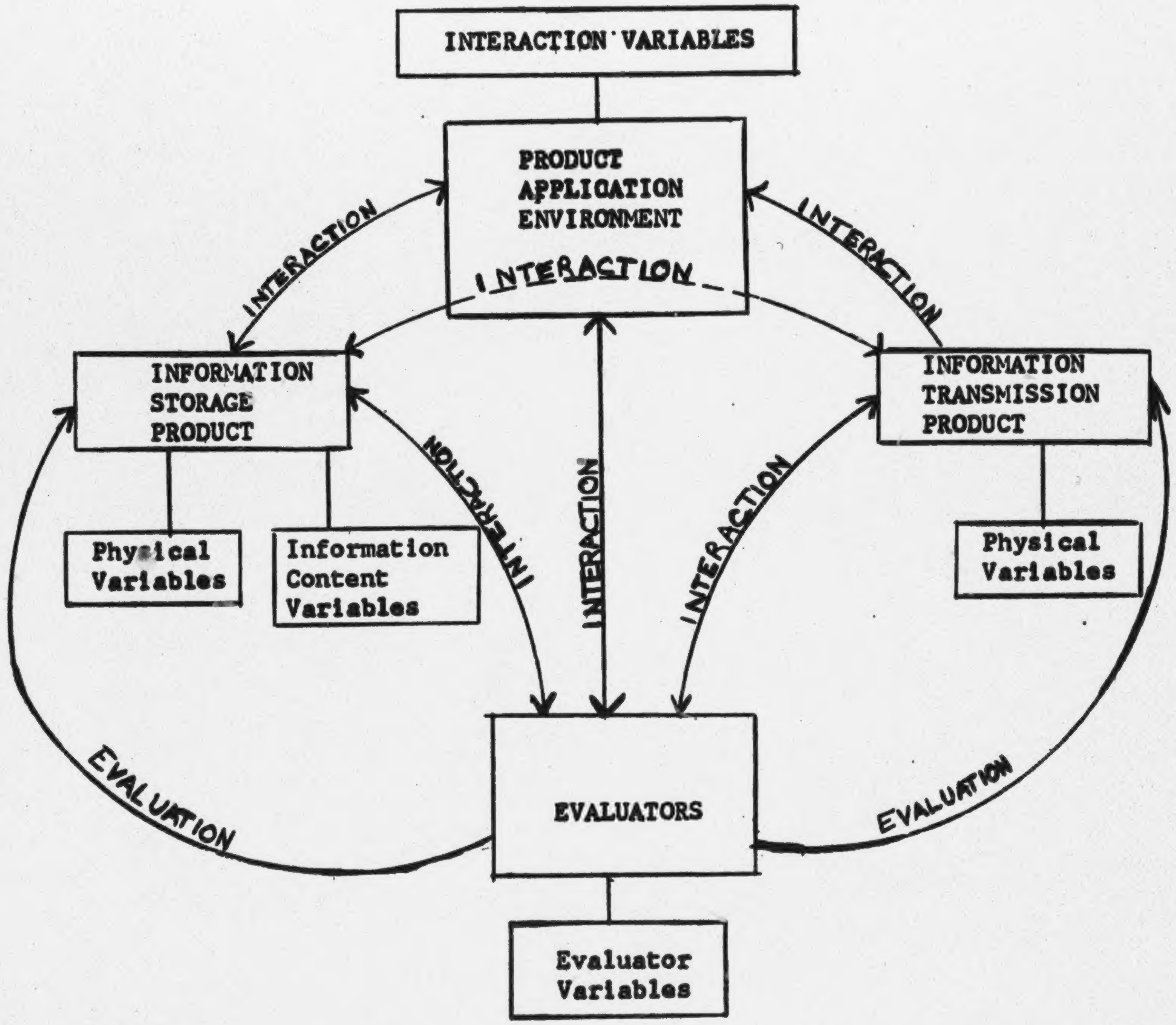
may be, or is intended to be applied.

It is also important to note that in certain instances, the concern may be with the interaction of an information storage product with an information transmission product, as in the case of movie films and projectors. As this interaction takes place within the application environment, the variables which describe the interaction (e.g. - film sprocket holes to projector sprocket fit) should be considered as environment application or interaction variables.

The diagram below is intended to represent the model concepts discussed above:

PRODUCT EVALUATION CONCEPTUAL MODEL


INTERACTION VARIABLES
PRODUCT
APPLICATION
ENVIRONMENT
INTERACTION
INTERACTION
INTERACTION
INFORMATION
STORAGE
PRODUCT
INFORMATION
TRANSMISSION
PRODUCT
Physical
Variables
Information
Content
Variables
Physical
Variables
INTERACTION
INTERACTION
INTERACTION
EVALUATION
EVALUATION
EVALUATORS
Evaluator
Variables

APPENDIX B

Partial Description of a Punched Card Combined Coordinate Index - Standard Class. Product Information Selection System

The basic information storage unit of the system should be a 12 row, 80 column punched card (e.g. - IBM card) which can be processed on sorters, collators, key punches, tabulators, etc. A specific number of beginning columns should be reserved for the entry of standard classification system code numbers or alpha-numeric entries (e.g. - 74328, AR293) which identify each card. In many instances, each card will represent those products which have been rated for a particular position on a value scale for a particular category of product selection information, according to a particular evaluator type. For example, if a nine-position scale were designed for recommending the subject matter competence which teachers should have, nine seperate cards would be used for recording the information provided by each evaluator type. Depending upon conformance to the policies on the minimum number of reports required/evaluator type, the system will permit the retrieval of information on up to three user type levels (e.g. - past users; past users who are teachers; past users who are teachers with an "average" subject matter competence), in any combination. This can be achieved by having the standard classification entry on each card designate the following information (# of card columns required for maximum needed adaptability also shown):

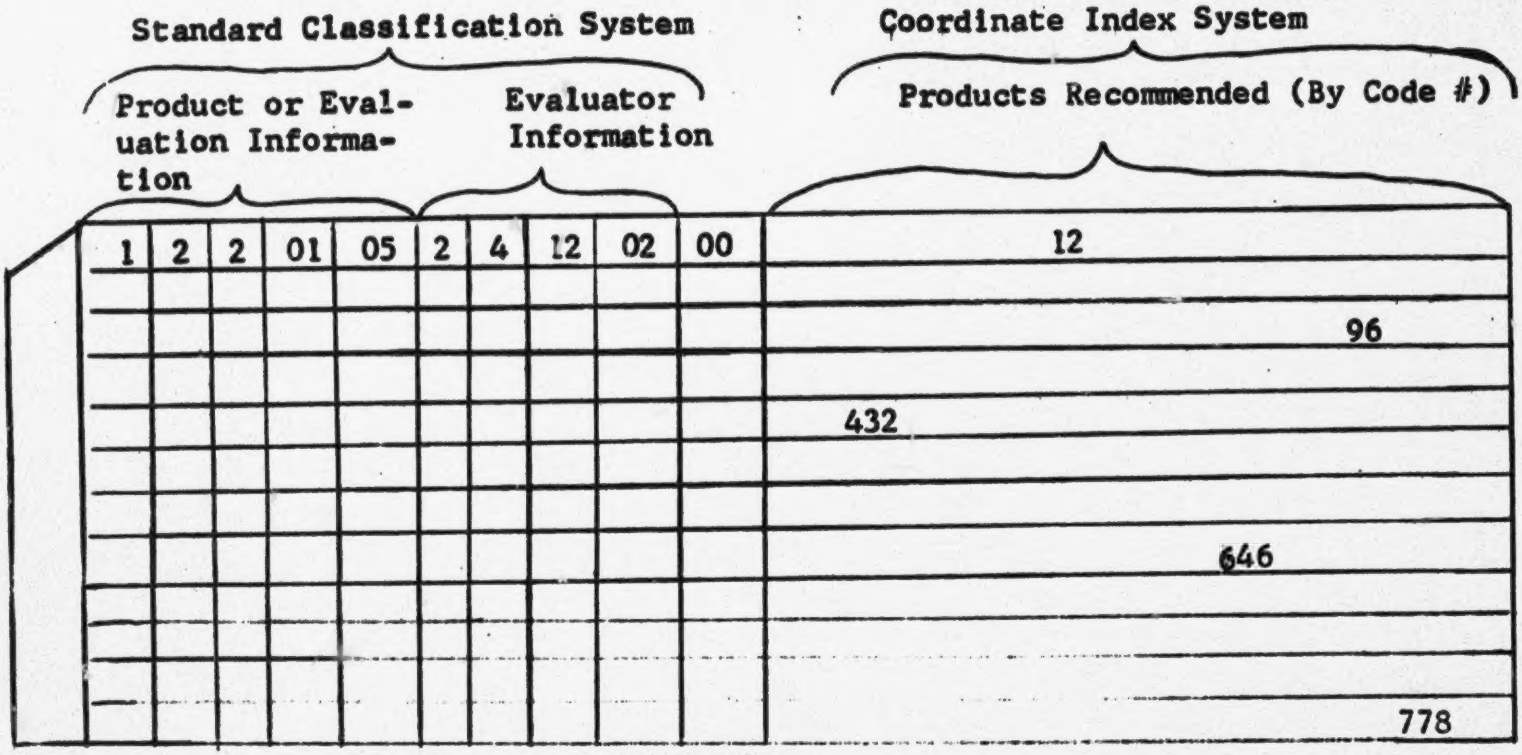
	# of Columns
1. The product module represented on the card (e.g. - Elementary Science vs. Overhead projectors-projectuals)	1
2. The general classes of product information (e.g. - general descriptive vs. recommended usage)	1
3. The major class of product information within the general class	

		# of Columns
	(e.g. teacher information within recommended usage.	1
4.	The minor class of product information within the major class (e.g. - teacher subject matter competence information within teacher information)	2
5.	A value on the rating scale for the minor class of product information (e.g. - "average" vs. "secure" subject matter competence).	2
6.	The major information source type (e.g. - past users vs. producer)	1
7.	The minor information source type within major (e.g. - students within past users)	1
8.	The subminor information source type within minor (e.g. - subject matter interest within student)	2
9.	The "value" or rating of the subminor information source type (e.g. - "low" subject matter interest)	2
		13 columns

Liberally, the storage of this information would require 15 columns on the cards (minimum = 13). The remaining 65 columns are available for designating specific products. Since there are 12 rows on the cards, there are 12x65 or 780 row-column intersections remaining to be used in designating specific products. Thus, within a product module, the system can accomodate up to 780 products on each card. This will probably meet the product limitation specifications to be developed under the guidelines suggested earlier. If more than 780 products are included in a product module, a second card can be created which duplicates the standard classification information on the first card, with product #781 up to #1560 indicated by the 780 row-column intersections on the second card. The second card would have to be designated as such (e.g. - by putting a (1) in the unassigned column #15) so that the analyst will know that a hole at a particular row-column intersection designates a different product than that designated on the first card by a hole at the same row-column intersection.

The card layout below is an example of the design discussed above:

Card Layout Showing All Elementary Science Products Which Have Been Recommended By Students of Low Subject Matter Interest For Use By Teachers of Average Subject Matter Competence


Standard Classification System
Coordinate Index System
Product or Evaluation Information
Evaluator Information
Products Recommended (By Code #)
1
2
2
01
05
2
4
12
02
00
12
96
432
646
778

Column #	Code #	Code Meaning
1	1	Elementary Science Product Module
2	2	Recommend Usage (Product Evaluation) (1st Level)
3	2	Teacher (2nd Level)
4-5	01	Subject Matter Competence (3rd Level)
6-7	05	Average (3rd Level Value)
8	2	Past User (Evaluator) (1st Level)
9	4	Student (2nd Level)
10-11	12	Subject Matter Attitude (3rd Level)
12-13	02	Low (3rd Level Value)
14-15	00	Columns Unassigned (Put 1 in Column 15 if Need 2nd Card)

In other instances, a similar layout will be used to record information about products. For example, one card may designate a specific price range on Elementary Science products. If the inquirer stated that he only wished to consider products within this price range, the card could also be pulled. When overlaid with these cards of the "recommended by - recommended for" type, products meeting the inquirers "recommended by - recommended for" specifications but outside the desired price range would be blacked out. Regardless of the particular information on a card, the same design principles explicated here should be applied in carrying out a further analysis of this design alternative.

Appendix C: Working Document

A Systems Design Including an Information Storage and Retrieval System for EPIE's Three-Year Development Period -- January 1968 - December 1970

During its development period, EPIE proposes to design and establish procedures for collecting, processing, storing, retrieving, and disseminating educational product information obtained from producers, analysts, and users, and for the synthesis of those three types of information for any given product.

The operational objective for the period is to develop the data system in a manner that will enable EPIE to provide services to its subscribers first in a broadcast mode, later in a responsive mode, then in an interactive, and, eventually, perhaps, in a customized mode.

To this end, EPIE must:

- Test operationally and evaluate the procedures and techniques used in collecting data and revise them as required.
- Design and operate a storage and retrieval system which will facilitate the carrying out of its purposes efficiently and at as low a cost as possible.
- Conduct research on how product information contained in the system is being utilized and may be better utilized by decision-makers in schools and industry.
- Experimentally explore and use methods for immediate automatic servicing of inquiries from subscribers in an interactive mode from remote "satellite" inquiry stations.

During each year of operation EPIE will invite professional committees to audit its information procedures. The audit committees will be comprised of outstanding personnel in the fields of education and information retrieval, who will provide an external source of evaluation and guidance for the conduct of the information effort. An additional source of guidance may be explored through four-day symposia conducted by EPIE to examine the theoretical and the operational constructs of the information.

The First Twelve Months. The first year of activity (see Figure I) would be directed toward evolving a developmental version of the EPIE information procedures. The effort would be undertaken within the Four-State Cooperative Project, designed specifically to assess the methods whereby EPIE would collect and exchange product information among schools in these and eventually other states. Therefore the major objectives of the first twelve months include:

- Pretesting the data collection instruments designed to gather product user information.
- Conducting extensive user interviews and analyses of utilization by participating schools in the four states to assess the appropriateness and usefulness of the information being provided to the user.

- Designing and training for the utilization of the initial version of the information storage and retrieval system in dealing with information gathered from producers, product analysts, and product users.

- Continuing the broadcast mode of service and trying out the responsive mode.

- Building an initional operating version of the storage and retrieval system.

- Identifying inquiries that may make special demands that cannot be handled by the system in a responsive mode, and developing computer software to handle certain categories of these inquiries.

- Evolving methods for synthesizing information.

- Providing professional audits of the information procedures.

The Second Twelve Months. During the first year of development, considerable experience will have been gained in following EPIE's information procedures. While plans for the second year are of necessity dependent on the results of observations of the first year, it is possible to see ahead the broad outlines of what will have to be undertaken.

For instance, in the second twelve months it will be possible to include some analyst and user product information in the broadcast mode of service, and to initiate for a limited number of schools the responsive mode of service in certain curriculum and equipment areas. Information on additional curriculum areas and equipment classes -- secondary school social studies, perhaps, and eight-millimeter films -- can be added to the available fund of data. (See Figure II.)

To facilitate the increase in service, extensive research will be undertaken during the second year in order to gain greater insight into the information needs and use of information on the part of product exchange users. As a corollary to this effort the computer programming designed to handle general requests will be modified to allow for integration of special-request software. Simultaneously, attention will be given to the evolution of guidelines for use of the data in a humanistic fashion, in both the interpretation and the collection of the product data.

The specific objectives for the second twelve months include:

- Refinement of data collection and dissemination instruments and documents.

- Collection, storage, and dissemination of information on addititonal equipment categories and curriculum areas.

- Synthesis of the three types of information into product profiles.

- Conduct of research on patterns of information use.
- Introduction of the interactive mode of service.
- Investigation of a customized mode of service.
- Development of software to handle special requests.
- Development and conduct of a field trial to explore remote teletype input-output systems.
- Evolution of guidelines for humanistic handling of information.
- Conduct of the first Information Symposium and provision for professional audits.

The Third Twelve Months. The principal theme during this time period will be one of continuous evolution. (See Figure III.) The focus will be upon the expansion of the system, increased user service, refinement of the operating system, and intensification of the analysis to determine user needs and utilization of EPIE information. The commitment will be to create a flexible, adaptable system which possesses sufficient resources to generate improvement and expansion on a continuous basis.

An underlying premise of the information effort is that some information is of less value to the "EPIE man" in making product decisions than other information. EPIE is committed to analyzing this problem as an integral part of its total effort. The activity relating to this area will be increased during the third year. Development of methods for bringing the desired information to the user more rapidly and in a more usable fashion will be investigated. Efforts will be made to increase the number of users of the system through various methods, including short-term trial use. This would also serve to test the upper operational limits of the operating system.

The overall objectives of the third twelve months include:

- Revision of the data collection instruments and procedures, based upon the data information research.
- Inclusion of information on additional curriculum areas and equipment classes.
- Expansion of user information research.
- Conduct of extensive field interviews with users.
- Exploration of limited user use of the system directed toward obtaining more EPIE users.
- Identification and establishment of new physical methods for querying the system and providing responses.
- Continuation of Symposia and professional audits.

Overall Operation of EPIE's Information Procedures. EPIE's activities during the first year will be directed toward making its procedures into an operating entity. It will be noted from the foregoing that the effort for this initial period is focused on the establishment and selection of the material to be maintained in the exchange together with detailed procedures for operation. During the second and third years the focus will be on improving and expanding yhe system.

Indexing and filing of data obtained form instruments used in the Four-State Project, from reports of professional subject analysts, and form producers; retrieval and dissemination of pertinent material in response initially to fixed requirements of users and later to flexible requirements; and continuous monitoring of the quality of retrievals with respect to user requirements as well as suitability of retrieval terms, will be undertaken,

Identification and Selection of Data. The primary sources of data will include interview protocols, mail questionnaires, telephone survey forms, reports form content analysts, and information from producers of products.

Operation of the Input System. The input subsystem includes the indexing and preparing for data base insertion of that information which has met the criteria for incorporation. Development of this subsystem includes evolution of thesaurus vocabulary for a gazetteer file and designation of the facets of a map file; user profile evolution; procedures to carry out indexing, accessions, filing, and dissemination functions; and establishment of the output processing and service functions required for dissemination.

The assignment of retrieval terms will be made by EPIE staff, consultants, advosory boards, and others experienced with the product classes under consideration.

Products of the System. The EPIE system will be one of a central data reference and control, serving to locate and retrieve the pertinent and appropriate data in usable form. Some of the prime outputs and products of the system include:

- A user product description with various levels of data related to the user request, which might include prior school use, students and teachers involved, grade level suitability, classroom use conditions, content strategies employed, etc.

- Data synthesized in such a fashion that it may be used in periodicals, monographs, etc.

- Tables, matrices, etc., showing relationships between users and data requested.

- User profile feedback forms, used by the receiver of the documents to evaluate the quality of retrievals against his request.

- Regular user profile analysis data, providing a record of those terms in the vocabulary and user profiles which have been successful in providing retrievals, or have formed the basis for dissemination against profiles and requests, and making possible the evaluation of the worth of key words used in the system.

- Management control reports for evaluation of system statistics. By keeping track of data entered, numbers and identification of those distributed to different types of users, and other statistics of operation of the system, a continuing measure for evaluation of the operation is available. User data cost analysis could be readily extrapolated from this system.

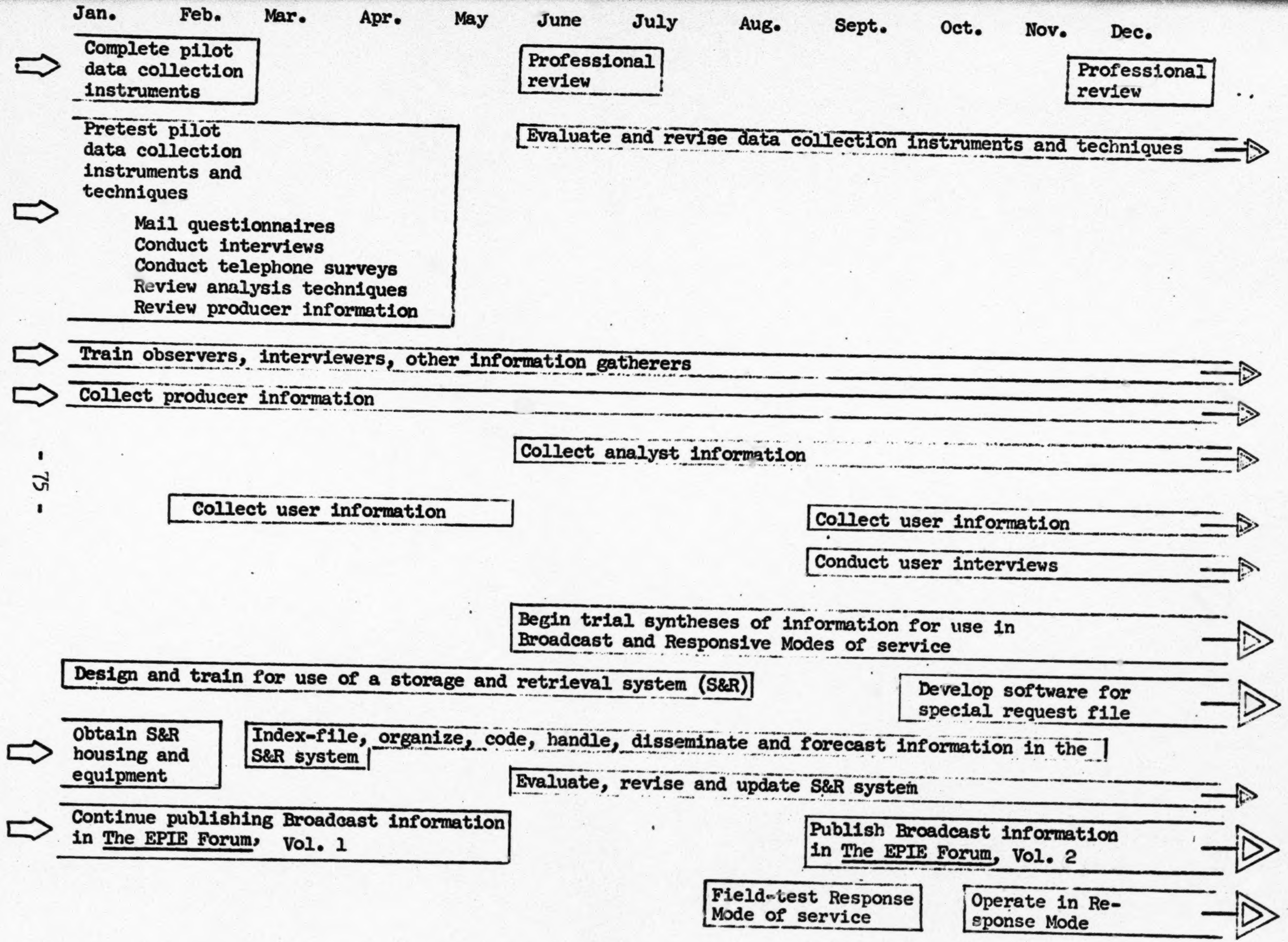
User Profile Development and Dissemination Techniques. Library experience has shown that regular dissemination of documents of interest to specialists in a field can best be accomplished on the basis of user interest profiles. The steps are, briefly, as follows:

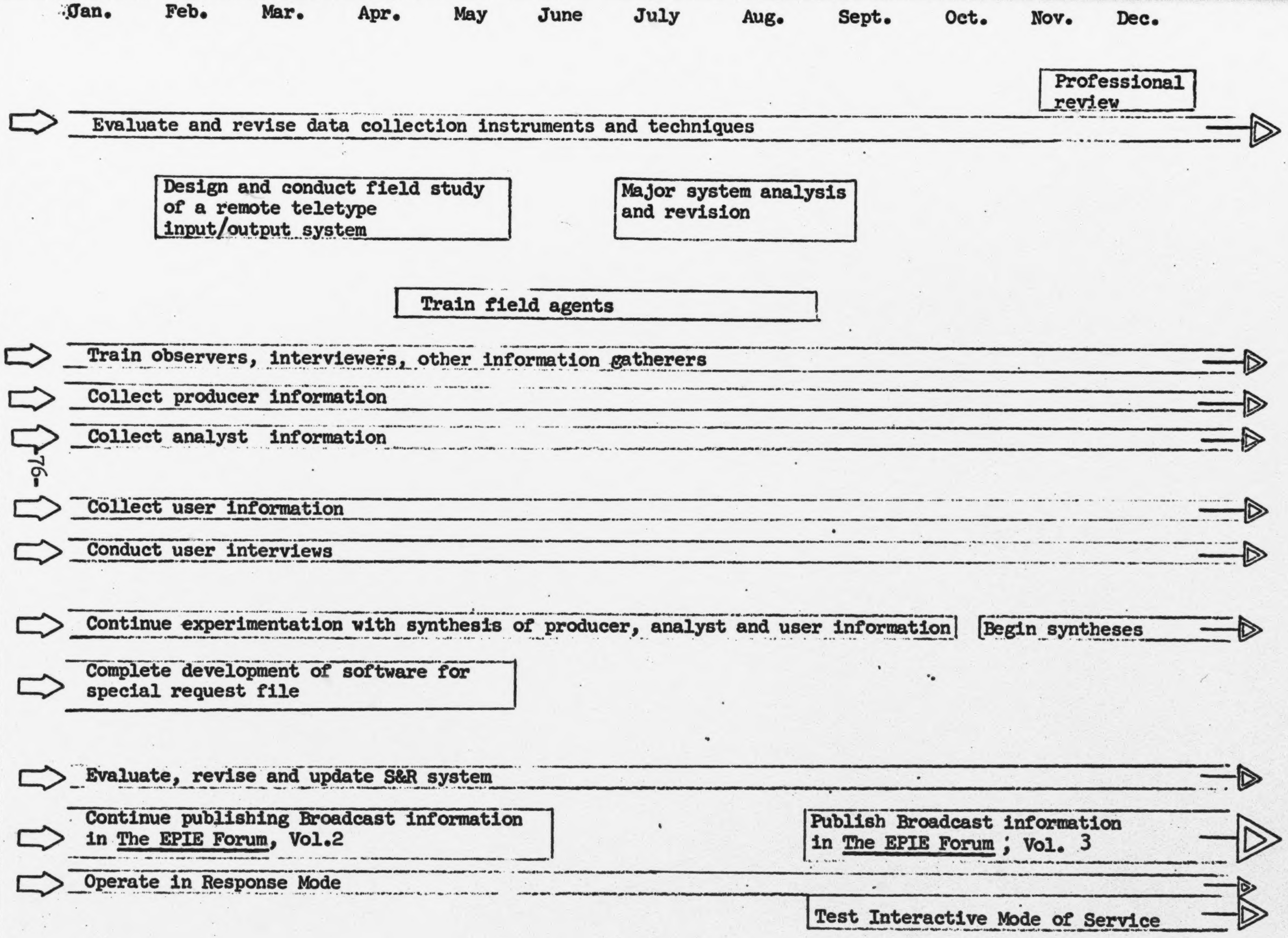
- Insure that the user has been given a clear picture of the overall design concept in which his profile will be operating
- Describe to the user the contents of a profile and how it will be used to provide him with relevant materials.
- Assist the user in constructing a list of terms by providing him with a thesaurus as a guide, but do not restrict him to those terms should he feel others to be more relevant.
- Provide a test period during which data are provided to the user on his profile.
- When the system is operational, prepare and deliver to each regular user a periodic profile review and analysis.

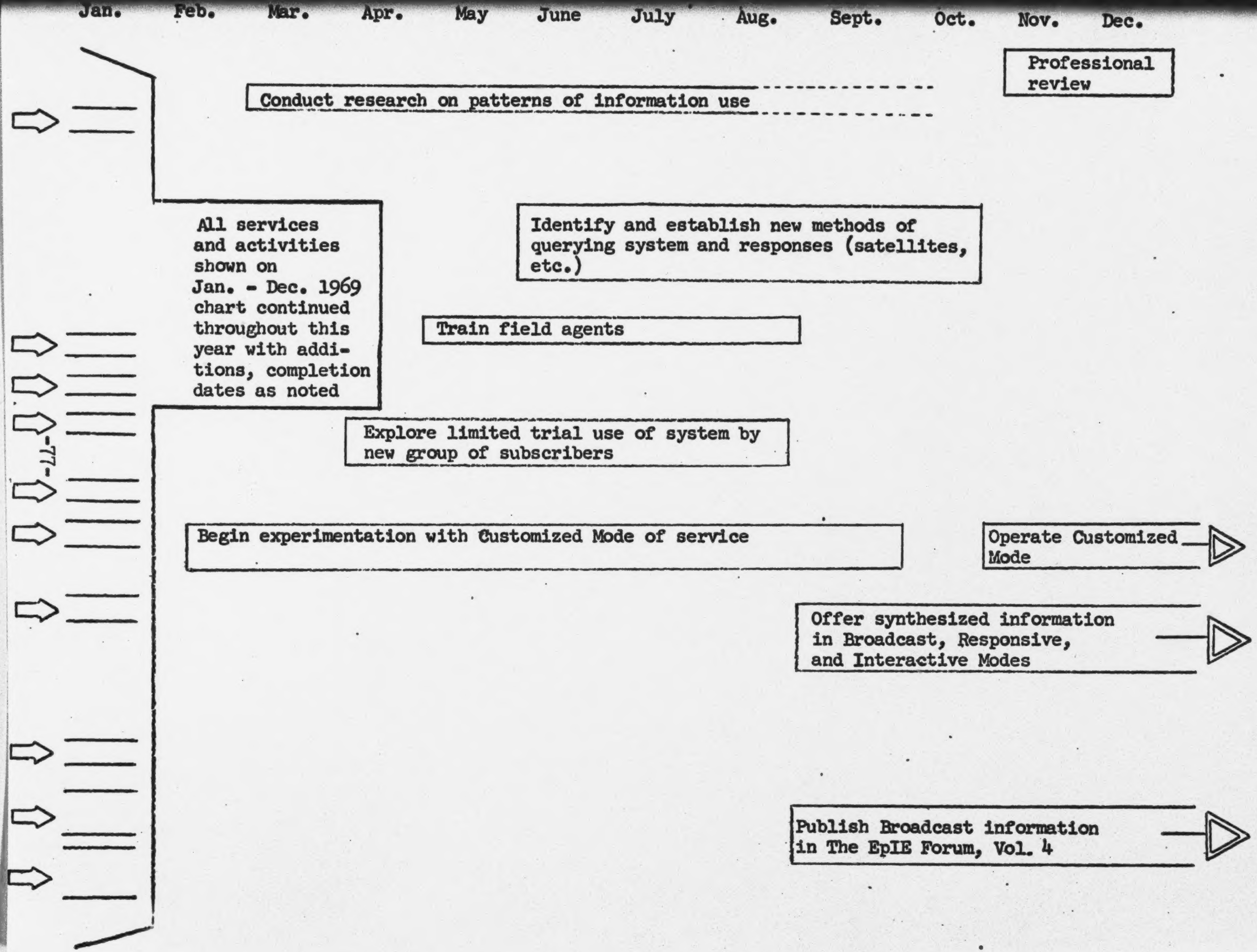
Operation of the Storage and Retrieval System. The initial design and development of the storage and retrieval system will be undertaken with the assistance of an organization which has had considerable experience in designing and developing computer-based information activities. Investigations will be made of the possibility of obtaining existing programs which can be utilized in EPIE's system with few modifications.

Thus far in the design of its information system EPIE has contracted with Community Systems Foundation, Ann Arbor, Michigan, for the creation of a working document describing an EPIE information system. Since the completion of that document EPIE has also received consultation on its systems design from System Development Corporation, Santa Monica, California.

Gradually as the system evolves, the contracting systems organization will train EPIE personnel in the procedures and techniques required to operate the storage and retrieval system. The organization would continue to consult during the three-year effort and would be responsible for the design and development of the special requests software. By the end of the third year the specialized organization's role would be almost entirely consultative.


Jan.
Feb.
Mar.
Apr.
May
June
July
Aug.
Sept.
Oct.
Nov.
Dec.
Complete pilot data collection instruments
Professional review
Professional review
Pretest pilot data collection instruments and techniques
Mail questionnaires
Conduct interviews
Conduct telephone surveys
Review analysis techniques
Review producer information
Evaluate and revise data collection instruments and techniques
Train observers, interviewers, other information gatherers
Collect producer information
Collect analyst information
Collect user information
Collect user information
Conduct user interviews
Begin trial syntheses of information for use in Broadcast and Responsive Modes of service
Design and train for use of a storage and retrieval system (S&R)
Develop software for special request file
Obtain S&R housing and equipment
Index-file, organize, code, handle, disseminate and forecast information in the S&R system
Evaluate, revise and update S&R system
Continue publishing Broadcast information in The EPIE Forum, Vol. 1
Publish Broadcast information in The EPIE Forum, Vol. 2
Field-test Response Mode of service
Operate in Response Mode


Jan.
Feb.
Mar.
Apr.
May
June
July
Aug.
Sept.
Oct.
Nov.
Dec.
Professional review
Evaluate and revise data collection instruments and techniques
Design and conduct field study of a remote teletype input/output system
Major system analysis and revision
Train field agents
Train observers, interviewers, other information gatherers
Collect producer information
Collect analyst information
Collect user information
Conduct user interviews
Continue experimentation with synthesis of producer, analyst and user information
Begin syntheses
Complete development of software for special request file
Evaluate, revise and update S&R system
Continue publishing Broadcast information in The EPIE Forum, Vol.2
Publish Broadcast information in The EPIE Forum ; Vol. 3
Operate in Response Mode
Test Interactive Mode of Service


Jan.
Feb.
Mar.
Apr.
May
June
July
Aug.
Sept.
Oct.
Nov.
Dec.
Professional review
Conduct research on patterns of information use
All services and activities shown on Jan. - Dec. 1969 chart continued throughout this year with additions, completion dates as noted
Identify and establish new methods of querying system and responses (satellites, etc.)
Train field agents
Explore limited trial use of system by new group of subscribers
Begin experimentation with Customized Mode of service
Operate Customized Mode
Offer synthesized information in Broadcast, Responsive, and Interactive Modes
Publish Broadcast information in The EpIE Forum, Vol. 4

Appendix D

Draft for Discussion:
Curriculum Analysis
for EPIE Work Conference, Dec. 11-14, 1966

Ira J. Gordon

One of the main problems curriculum people face is to create some internal consistency in their programs. To do so the theory of instruction inherent in the marketable supplies and programs being suggested must be analyzed. These offereings must be able to be examined so that completely disparate systems will not be used unknowingly.

Any brief review does not do justice to the programs discussed nor are they assumed to be typical curricula for all children. The purpose is to deomonstrate the use of the criteria to assess materials.

A way of approaching materials is to ask: what assumptions, postulates, or hypotheses are evidenced in the material concerning: (1) pupil characteristics as (a) the nature of the child, and (b) the nature of how children learn or how learning occurs; (2) instructional situations as (a) the sequencing of experience, (b) the selection of didactic materials, and (c) the nature of interpersonal relationships; (3) goal characteristics, what are both the immediate and long range goals and purposes.

In order to test whether these procedures are usable three different areas have been selected and particular projects identified within the areas. In the field of "the new math", we will look at Robert Davis's Madison Project, an integrated systematic approach. Second, from the sciences we will look at the Biological Science Curriculum Study. Third, fromtthe area of social studies we will examine one of the projects in the Developmental Economic Education Program sponsored by the Joint Coincil on Economic Education. These samples may not be typical and shoild be considered merely as illustrative.

I. Pupil characteristics

Examples:

A. Robert Davis's Madison Project in Mathematics is one example of a new curriculum.

> "...every effort should be made to get the students thinking and talking, not listening and accepting." (Davis, 1964a, 18).

> "(Children) learn because, on the one hand, they are happy, and on the other hand, intellectual challenges are abundantly present in many attractive forms." (1964a, 7).

B. BSCS

(Ed. Note: While the nature of the child and of how he learns is discussed briefly, chief emphasis in Gordon's discussion is given to the process by which the learning occurs. It is noted below.)

The process is one of enquiry and discovery. There are demonstrations and observations, experiences in participation. There are 12 characteristics which might be thought of as indicative of a discovery approach. These are:

1. Concepts are presented by the inductive method.
2. Concept presentation is initiated by a problem situation.
3. The materials encourage active participation of the learner in textual as well as laboratory investigations.
4. The materials are structured to raise questions in the mind of the learner.
5. The structure demands that the learner organize his knowledge.
6. The structure encourages the learner to ask questions utilizing previous information.
7. The materials present the student with new information.
8. The learning environment is manipulated, not the learner.
9. The structure allows for differences in the student's level of cognitive development.
10. The generalization to be learned is withheld from the learner so that he can discover it for himself.
11. The "discovery" made by the learner is not necessarily new to civilization; it is new in relation to the previous cognitive development of the learner.
12. The investigative procedures used are open-ended; the teacher does not know all possible results and explanations which may grow out of a presentation.

C. DEEP

The statement of goals for the elementary level gives an indication concerning the nature of the child. The authors state: "The main purpose of economic education in a free society is to develop the problem solving ability of our children as it relates to personal and social problems, basically economic in nature. To accomplish this purpose we must:

1. develop the child's analytic ability
2. help the child relate his everyday experiences to the big world around him

Even a first grade child has economic decisions to make." (1964, 1-2)

Several inferences (about the nature of learning) are possible: (1) learning occurs best under discovery and problem solving conditions; (2) particularly for younger children, first-hand direct experience and personalized meanings are important; (3) learning problem solving per se is a basic part of learning economics.

It is clear that Davis sees the child as a cognitive information processer. He is concerned with the development of concepts and he feels that introduction of abstract experience should be earlier in the grades. There is the assumption that readiness builds on earlier experience and that this experience in mathematics, at least, must be encountered earlier.

The notion of positive reinforcement permeates the thinking behind this project, although Davis does not say so, with the teacher actively encouraging the child's responses.

It is, however, important to know that the teacher's response is to be guided not by the correctness of the answer but by the spirit of encouraging the child to continue to try.

The child in the Madison Project classroom is expected to utilize trial and error learning as a part of the discovery concept.

In place of demonstration and observation, Davis stresses experience and participation. Indeed, if there is a key concept in his approach it is this ambiguous notion of experience. Experiences are often seen as the end as well as the means.

In BSCS, the child is seen as an information processor and an enquirer. But, what a child learns is not necessarily a function of what he wants to learn or what is useful to him. The concept of needs used by BSCS are all in the cognitive domain.

Neither cognitive dissonance nor positive reinforcement are clearly indicated. Indeed the position is unclear, except for the vague conception of "discovery" and activity. . .

An analysis of the text and laboratory indicate that they make extensive use of presenting concepts by the inductive method, in initiating concept formation by a problem situation, by presenting concepts through active learner participation, raising questions, and presenting new information. The analyst states the laboratory has a total effect of moderate accomplishment of the methods of discovery learning.

Words are important in biology both in its classical taxonomic forms to which we were subjected by as students and in its modern conceptual design as presented by BSCS. Labelling, categorizing, naming are all very much part of the game. Group discussions help, however, and seem to be indicated in the various materials developed by BSCS.

There is focusing on relevant materials. However, the focusing in BSCS seems to lack sharp definition. The principles upon which students are to focus are also at rather high levels of abstraction and it may be that exercises in which youngsters engage are several steps removed from the principl

The main source of data in the Developmental Economic Education Program is The Joint Council on Economic Education Program, teachers guide to Developmental Economic Education Program, suggestions for grade placement and development of economic ideas and concepts.

The child is seen as a problem solver, and, more than that, someone who is concerned with utilizing academic concepts to handle his daily needs. A cursory view of the various ideas and concepts to be developed at elementary, junior, and senior high level indicates a belief in development of the child from someone who can deal with materials only at a concrete, highly personalized, immediate perception level to a youngster who can relate abstract concepts to other abstract concepts, who can analyze "big ideas," who can engage in the utilization of abstract symbols and who is able to handle a variety of equations utilizing abstract labels. Essentially, the cognitive domain is stressed with effect and personal involvement diminishing as one moves up the developmental scale in this guide.

For younger children role-playing, dramatization, puppets, resource people, parents are all utilized to provide experiences in illustrating the economic concepts. Problem solving is seen as a skill to be exercised at every grade level and the steps are the symptoms of the problem, certain aspects of the problem, causes of the problem, and solution to the problem.

II. Instructional situations

Examples:

In sequencing in the Madison Project,

> "children are asked a carefully devised sequence of questions, which gradually lead them to formulate techniques of solution and to discover generalizations." (1964a, 8).

> "Cues and answers are withheld to allow the child to discover the internal organization of the subject." (1964a, 9)
>
> The didactic materials serve as self teaching devices.
>
> For interpersonal relations, "...It is for the child to decide what attitude he will take toward his superiors, but their attitude toward him is to respect him as an equal, and a friend." (1964a, 6,7).

In BSCS, whatever sequencing there is seems to be under the control of the teacher, but just how this control is exercised is not clear.

The student uses the didactic materials in controlled situations to develop or to discover for himself the existence of these principles, rather than having them stated in, to use Ausubel's term, "advanced organizers" for him. Through the manipulation of the didactic materials, he is expected to develop his concepts.

It is in the area of interpersonal relations that BSCS gives no information beyond the idea that the teacher is to encourage and challenge.

DEEP, with the spiral curriculum developed around basic concepts, has concepts increasing in scope and complexity, depending upon the understanding and economic sophistication of the pupils. Teachers should plan to reinforce at higher grade levels concepts introduced at the lower elementary level.

Didactic materials are sued in ways similar to the following example.

"To illustrate how instability occurs in our economy the child can dramatize the production of various articles for a given year. After the dramatization, children will place on the table toy models of what they have produced. One person, who is the chairman of the group, will purchase all of these goods and services with toy money. The toys piled on the table represent the GNP. Then the teacher will explain that whether industry continues to produce or not depends upon the intentions of the consumer, business and government, and foreign countries."

In the area of interpersonal relationships, there are no direct suggestions in the guide for teacher-pupil relationship or for pear relationships.

Davis defines a teacher as a moderator or a discussion leader as one who asks a series of leading questions and as one who observes and listens to children. The teacher plays a central role as the organizer of experience, although this seems to be more an art than a prescription.

Although the child may have the impression that the experience is haphazard, and although there is no real effort to strengthen the sequence and eliminate all "noise", nevertheless the sequence is determined by the structure of the discipline. This is what the child is to discover.

The teacher is not to give answers or let the child know exactly what is expected or to be discovered.

There are no concrete materials utilized in the sense of the manipulation of objects. However, materials are concrete in the sense that the child can assess his answer against whether it works or not, rather than relying upon authority judgment from the teacher.

There are positive injunctions in the Madison Project for how the teacher is to behave. The teacher is an encourager and respector of the child, providing a warm accepting climate.

In BSCS, there is obviously a conflict among the biologists as to which basic principles to center upon and what ordering of materials is desirable. The existence of (...differing) versions in which sometimes the same materials are used but appear in different orders, would certainly indicate tremendous research possibilities for the investigation of appropriate sequencing of materials in biology. It might also be indicative, subject to research, that sequencing really doesn't matter.

The laboratory materials particularly seemed to have been selected with a notion of what is necessary and sufficient for concept attainment. The student deals with real objects and he tests principles. He finds out and develops his notions from what happens to these materials as he works with them. They do not seem to be selected to represent fixed answers to fixed questions.

There seems to be no understanding of the role of affect in learning or any concepts of classroom climate. There might be great discrepancies between what is written in the textual materials and the mood and spirit in which life is lived in the classroom. This is not meant as a criticism, since this was not a key focus for BSCS. It indicates that it has incomplete assumptions about classroom behavior and learning.

In DEEP, concepts are dealt with through problem solving analysis at each grade level with a movement from concrete to abstract-symbolic, from personalized effective loading to depersonalized rational analysis.

It seems as though the didactic materials from junior and senior high school are all words whereas in the elementary schools they may be such things, as, in teaching competition, setting up a lemonade stand and selling lemonade, with the second child cutting the price or pretending to. In the elementary grade, it is suggested that all play certain jobs to illustrate the importance of division of labor. There is also the utilization of films, filmstrips, photographs, painting materials, toys, and other objects that may illustrate particular concepts.

The materials used directly relate to the concepts to be learned, offer children opportunities for direct perceptual experience which can lead into discussion and elaboration.

(In the area of interpersonal relations, Gordon indicates that some suggestions for elementary children seemed somewhat naive about how children relate to each other when they are other than middle class children or even just children. Two examples were cited.)

III. Goals

Examples:

In the Madison Project, a key purpose is to immerse youngsters in mathematical experience so that they will become familiar with the concepts indirectly, and so that they will then be able to utilize them without necessarily being conscious of their knowledge.

In BSCS, perhaps a very brief line from the Teachers Commentary will indicate the goal:

> "A sound sense of the nature and values of science, may lie in the new responsibility of science teaching." (1960, XIII).

To explicate this, scientific knowledge is analyzed for its utility.

Two project examples are cited because of their diverse approaches to goals.

The pittsburgh program, for twelfth graders (1965) sees children and learning in terms of problem solving on topics fraught with personal meaning. Although it deals with concept development, it recognizes the concepts have affective loading.

On the other hand, the Santa Rosa material stresses a highly analytic cognitive attack. In one lesson for twelfth graders, it is stated, "This lesson is largely inductive...the first discussion, after filling in the chart, should allow the class to induce some of the generalizations suggested."

Nowhere is it clear that children are ever asked, in the Madison Project, why they should wish to learn whatever is being presented. It is assumed that curiosity is a sufficient beginning motive and that competence will take care of itself, although certainly competence is a goal. There are no concepts to transferability, and what is to be discovered is to some degree left to chance. There is further, to use Davis' terms, no "specified level of achievement." In this respect, what is learned by each youngster is highly individual and Davis is not concerned with verification.

Major concepts are that the notion of fixed maturation must be called into question, and that instruction or experience of particular kinds may very well lead to modification of cognitive structure.

It is clear from BSCS material that the major goal is a content goal. It is not to change the learner, or to have him feel that biology is fun, or to develop his general intellectual capacity. The main goal is to enable him to learn the structure of the discipline of biology, in effect as a biologist learns it.

One would suppose a major goal is learning to learn, that is learning how to enquire so that one may continue to enquire throughout his life. There is some notion of application to social problems, but certainly the didactic materials and textual materials do not indicate any way in which biology is transferable to such problems as conservation, water supply, and air pollution, for example.

When we come to goals the DEEP guide is very clear. There are the concepts mentioned under sequencing to be learned, there is the emphasis on teaching children to solve problems, to think in economic terms, to be able to perceive relationships between history, geography, economics and other social studies, and to relate to the world. The DEEP materials much more directly relate to their goals of citizenship than do the BSCS materials. Although obviously there are economic concepts to be learned, there are also consistent attempts to apply these to the life of the student.

It is to the credit of the Joint Council that two such diverse programs as those in Pittsburgh and in Santa Rosa can emerge from its guidelines but it certainly reflects differences in assumptions about the nature of children, the nature of learning, the goals, the selection of didactic materials, and what might be called a theory of curriculum development or a theory of instruction in the field of concept attainment in the area of economic concepts.

Conclusion

I have attempted, not to analyze the projects, but to discuss whether the criteria can and should be used this way, and whether this demonstration is valid.

Appendix E: Written for Participants

SECOND LAKE MOHONK WORK CONFERENCE
April 8-10, 1967

Present: Abramovitz, Baranski, Denny, Easley, Filep, Goodman, Gordon, Harris, Komoski, Lockhard, Morrissett, Odell, Preston, Stake and Stevens.

PKK introduced new participants to the group, and stated the purposes of the meeting:

1. To design and define the pilot study in a four-state area, and to draft a Title V proposal for the four states.

2. To define as fully as possible the techniques to be used in analysis of elementary science material.

The group to work on the first objective to consist of Komoski, chairman, and include Denny, Preston, Stake, Filep and Harris. The second group to be chaired by Goodman, and include Morrissett, Stevens, Baranski, Lockhard, Gordon, Odell Easley and Abramovitz.

CURRICULUM ANALYSIS WORK GROUP

FG opened the meeting by seeking to establish what the exact goal of the group should be. It was agreed that it should be a document spelling out as far as possible the variables to be used in logical analysis of educational materials, and guidelines on applying these. They felt that though this document should apply to elementary science materials, it should be as general and universal in application as practical, and relate to both books and non-printed materials. Some testing of schemes would be done on the Harcourt, Brace & World series.

Consultants discussed their various outlines for analysis and differences showed up in definition of terms, stress on areas of concentration, and units used for investigation. However, there was complete agreement on major classes of variables to be used. Emphasis was laid by all on the need for flexibility and open-endedness in any system developed, and the importance of revising and amending lists as data come in from users.

In answer to questions about actual use of a storage and retrieval system, FG explained that any system used by EPIE would be able to accomodate inputs in various forms, from checklists to paragraphs. It was pointed out that checklists make information comparable in a way reviews do not; however, some information is difficult or impossible to fit into checklists. The information gathered by logical analysis will be only one type of information in the system, and will be supplemented and checked for reliability by information from producers and user reports.

The question of unit of analysis was discussed, as each consultant had a different method of approaching material to be investigated. The purchasable unit has been chosen by EPIE as the basis for its answers to queries, and this varies from quite small (one booklet) to large (a whole series). Material will have to be reported on in small units, and also in large assemblages.

Consultants discussed what, and how much, information would go into reports. Reports would be written, using all information in the system in whatever form, then in answer to queries, summaries to the user would be supplied, oriented toward his specific needs.

Purchasing and decision-making procedures were taken up. The group felt that not enough is really known about this now, and that the pilot study should clarify to some extent who makes decision, on what information, and what the schools really want from EPIE. The ERIE questionnaire should provide useful data on practices in New York and Pennsylvania. EPIE's consultants are making assumptions from the university level, may not be applicable. It will be necessary to choose variables for consideration according to their best judgment and see how these fit users' expressed concerns. It is believed that information will only be desired on new materials, copyrighted within the past two years. Important to think of users' needs, not general academic view of textbook.

As soon as any information is in the system EPIE can start reporting it, and add more as it comes in from other sources. Probably producer descriptions and claims will be the earliest inputs, with logical analysis and user reports coming in later. User information will not be reported out until there are enough replies to give reliability. EPIE will review and analyze supplementary materials as well as textbooks. At the center at the University of Maryland, their main concern is with hardware and software, not books. Teachers need information on new materials even more than books. They are also interested in the amount of training necessary to use them.

Questions were raised about the dependability of "inferences" made by analysts. These may vary greatly and should be documented where possible from the material; the analyst's identity and background should also be noted.

The group discussed how to start working on forms and training of analysts; a timetable is being worked out. Gordon, Easley and Lockhard are sources for available manpower during the summer months, some free.

Questions were asked about the usefulness of the ERIC thesaurus and Bloom's taxonomy as a base for lists. FG explained that words were only put into the thesaurus as materials using them came in, and there were few science materials so far. He felt that it would be a good resource; Bloom's taxonomy would also be good, though not useful for retrieval purposes.

Compatability of reports was discussed again. The group agreed that analysts must be free to work in different styles, that different points of view would give more information to system. Information would be pulled together in reports. Types of cards and coding were discussed, and the relative merits of direct and inverse coding explored. Direct coding better for computer systems, but inverse coding is a valuable tool for suggesting possibilities. Can use direct cards for inverse sorting.

Mechanical means for getting into material were discussed, such as KWIC index, classifying all questions, or activities, etc. to give analyst a way to start.

Group tried out systems on BH&W material, with favorable results as to feasibility of use and general agreement on evaluations. Both text and supplementary kit were examined.

Consultants agreed that EPIE system of analysis must be composed of several systems. At the end of meeting they submitted papers outlining their systems and suggested guidelines for conducting investigations, which could be used in training other analysts. FG prepared an overall summary report of all systems.

Appendix F: Working Document

J. A. Easley
April 1967

Plan for EPIE Elementary Science Series Analysis

Introduction:

It is proposed, during the summer of 1967 (June 15 - August 15), to analyze at least three or four elementary science series with auxiliary teaching materials at the University of Illinois. During the first week, we will orient the team of analysts to the sets of descriptors required for the analysis and to put the final touches on the lists of descriptors and the forms to be used for recording purposes. The analysis will work from the rationale outlined Easley at the Second Mohonk Conference. It is expected to be similar to the system he used to analyze contemporary standardized biology tests (A "Bio Assay" of Biology Tests). The sets of descriptors used in this project will be developed especially for elementary science series. However, the summaries of the analyses, which will be prepared for each purchasable unit, will be directly relatable to the general-purpose outlines prepared by Gordon and by Morrisett and Stevens.

Analysts:

The team that will be used to develop and carry out the analysis procedures this summer will include three members of the Science Department of University High School, one of whom (Kendzior) was involved in the Biology test project. It will also include a staff member (Guthrie) of the Training Research Laboratory (TRL) who is experienced in the analysis of conceptual tasks. Easley will direct the operation and do much of the writing of summary reports.

Planning Discussions:

Before and during the two months, the analytic techniques will be discussed from theoretical as well as practical points of view. The following persons are expected to contribute to the discussions: Hastings, Atkin, Stake, Glass, Millman, Denny, Shoressman, Gould, Payette, McGuire and Anderson. Two of these persons will need to be employed as consultants in the early part of the two-month period.

Elementary Science Materials:

The four series to be analyzed will be selected so as to ensure early and optimum access to user information as well as to test the analysis system by a broadly representative sample of materials. It is expected that the materials themselves will be available through the University's Curriculum Library. If a set is desired for analysis which is not available here, other means of obtaining it will have to be found.

1

Code for Location of Assignable Unit

Publisher Abbreviation, Year of Publication, Grade Level, Chapter, Page(s)

e.g. Silver Burdett	1965	6	19	234-5

becomes: SB-65-6-19-p234-5

note: When the assignable unit is found in the Teacher's Guide only (TGO) its location on the page will be found on the left of the space in ()'s.

Code for Format of Assignable Unit

Information about student pages is found to the right hand side of the space provided on the analysis sheet.

includes	Text	T	
	Question(s)	Q(No.)	
	Activity	A	
	Photograph, color	P_c(No.)	black and white P_b(No.)
	Drawing or Diagram	D_c(No.)	D_b(No.)
	Chart	C_c(No.)	C_b(No.)
	Graph	G_c(No.)	G_b(No.)
	Activity Located Only in Teacher's Guide		TGO

e.g. An assignable unit with some textual material, three questions, one black and white photograph and two color drawings.

becomes: T, Q3, P_b, D_c2

An assignable unit with some textual material, an investigation, one question and a chart in color

becomes: T, A, Q, C_c

An assignable unit which is an activity suggested by the Teacher's Guide but not mentioned in the student text

becomes: TGO (This will be located on the left hand side of the space provided on the analysis sheet)

2

Adverbial Descriptors

A numerical scale from 1 to 5 is used where the numbers represent terms in the following lists.

1. Impressively
   Outstandingly
   Strikingly
   Skillfully
   Cleverly
2. Clearly
   Completely
   Effectively
   Sufficiently
   Interestingly
   Appropriately
3. Adequately
   Suitably
   Satisfactorily
4. Routinely
   Commonly
   Unclearly
   Incompletely
   Ineffectively
   Insufficiently
   Inappropriately
5. Erroneously
   Poorly
   Weakly
   Stereotypedly
   Boringly

Most often these words are used to mean Excellent, Good, Average, Poor and Very Poor, (in order from 1 to 5) as they are actually used in practice.

Methods of Presentation

Asks Question(s)	(AQ)
Compares	(Com)
Defines	(Def)
Describes	(Des)
Explains	(Exp)
Gives Directions	(GD)
XXXXXXXXXX	
Lists	
Mentions	(Men)
Presents Historical Background	(PHB)
Presents Information for Analysis	(PIA)
Presents Model	(PM)
Presents Theory	(PT)
Presents Vocabulary Exercise	(PVE)
Suggests	(Sug)
Summarizes	(Sum)
Tells Story	(TS)
Uses Analogy	(UA)
Exhibits or Demonstrates	(EXH)
Leads Discussion	(LD)
Leads Field Trip	(LFT)

3

Student Task Expected by the Assignable Unit

Apply Knowledge to New Situation	(AKNS)
Calculate	(Calc)
Comprehend	(Comp)
Consider	(Cons)
Construct Chart	(CC)
Construct Graph	(CG)
Construct List	(CL)
Construct Model	(CM)
Construct Picture	(CP)
Decide	(Dec)
Describe	(Des)
Explain	(Exp)
Hypothesize	(Hyp)
Interview Authority	(IA)
Invent	(Int)
Investigate ("Experiment")	(Ivst)

Keep a Record	(KR)
Look at Suggested Readings	(LSR)
Make Collection	(MC)
Memorize	(Mem)
Observe	(Obs)
Organize	(Org)
Plan	
Predict	(Pre)
Present Demonstration	(PD)
Present Report	(PR)
Read Reference Materials	(RRM)
Recall	
Recognize	(Reco)
Review	(Rev)
Take a Field Trip	(TFT)
Wonder	(Won)

Image of Science Given by Assignable Unit "Science is"

Attacking Problems	(AtP)
Classifying Things	(ClTh)
Controlling the Environment	(CTE)
Cooperative Human Endeavor	(CoHE)
Creative Human Endeavor	(CrHE)
Curiosity	(Cur)
Discovery	(Dis)
Exploring	(Expl)
Facts	
Growing Things	(GrTh)
Ideas	
Learning about Myself	(LaM)
Making careful Observations	(MCO)

Making Measurements	(MM)
Making Things	(MTh)
Messing About	(MA)
Nature Study	(NSt)
Openmindedness	(Ope)
Persistent Human Endeavor	(PHE)
Specialized Language	(SpL)
Taking Things Apart	(TTA)
Technology	(Tech)
Verifying Things	(VTh)
Working Carefully	(WC)
Mysterious Phenomena	(MP)

4

Mode of Assignable Unit

Behavior- activities of individuals.
action of any material.

) Classification- assignment to groups within a system of categories distinguished by structure, origin, etc.

) Composition- manner in which parts are combined. the constituents.
organization or grouping of the different parts.

) Development- growth or expansion.
going through a process of evolution..

) Distribution - places where things of any particular category occur.
location.

) Existence- state of being.

) Interaction - action on each other.

) Origin - that from which anything arises.
the source.
the first stage of existence, the beginning.

) Process- systematic series of actions directed to some end.
a continuous action, operation, or series of changes taking place in some definite manner.
action of going forward.

) Structure- arrangement of parts, elements, or constituents.
an organization.

r) Transformation- change in appearance, nature, character, form.
change to another substance.

u) Function- to serve, operate, carry out normal work or activity.
the use.

e) Relationship- a particular connection

5

UNIT SEVEN: PLANTS AND MORE PLANTS

METHODS OF PRESENTATION

Section 5: Grass Plants from Seeds

CONCEPT
Organisms (living things) reproduce their own kind.

LESSON 7, page 70

SUBCONCEPT: Seeds produce the kind of plants from which they came.

Aim of the Lesson

To provide opportunity for children to observe how grass-plants grow; to help them identify cereal plants as grasses.

Introducing the Lesson

DS
USSION,
SKS
ESTION,
HIBITS

REQUIRED: a complete grass plant, with roots visible in a glass of water (if possible, secure a plant in flower or seed stage); hand lens magnifying glasses.

Let children take turns using magnifying glasses to examine the parts of the *grass* plant. Tell them where the plant was growing when you dug it up. Lead the class into a brief discussion of grass, which grows in so many different places. Encourage them to wonder about:

How do grass plants get started?

Developing the Concept

(by emphasis on the subconcept)

1. Direct attention to the first sponge in the top picture on page 70. Help children to read *oats* on the card standing in the sponge. Call on someone to tell what has been done with the oat seeds. Ask what will happen to the oat seeds when they get wet. Encourage children to reason that the wet seeds will sprout and then grow into new oat plants. Discuss foods (oatmeal, dry oat cereals, etc.) that are made from the seeds of oat plants.

2. Next, ask what kind of seeds are being "planted" on the wet sponge in the middle of the pan. Ask what will happen to the corn seeds that are "planted" in the middle sponge. Children will reason, from experience, that the corn seeds will grow into new corn plants.

Invite the class to tell about various corn foods they like to eat. Ask what part of the corn plant we use for food.

3. Then direct attention to the third sponge at the top of page 70. Ask for a volunteer to read the label by the sponge and tell what kind of seeds are to be "planted" on that sponge. Help children to understand that these seeds are the kind we use to grow lawns. **What kind of plants will grow from the grass seeds?**

Through discussion of the top pictures, guide children to the following assumptions:

> When the seeds get water, they will sprout and grow into new plants.
> Each kind of seed will grow into that kind of plant.

4. Have the children study the picture at the bottom of the page to find out what has happened to the seeds. Help them to read the question: **What kinds of plants are growing?**

If no one notices that all of the plants look somewhat alike, guide them to this observation by direct questions.

As the observations are made, explain that oats, corn, and grass belong to the grass family. Encourage children to compare the leaves (or "blades") with those on the bean plants growing in the classroom (or in Lesson 1, page 62).

Children will probably mention other kinds of grass plants whose seeds are commonly used for food: rice, wheat, rye, barley. Invite different pupils to tell of foods they like that are made from some of these "grass seeds."

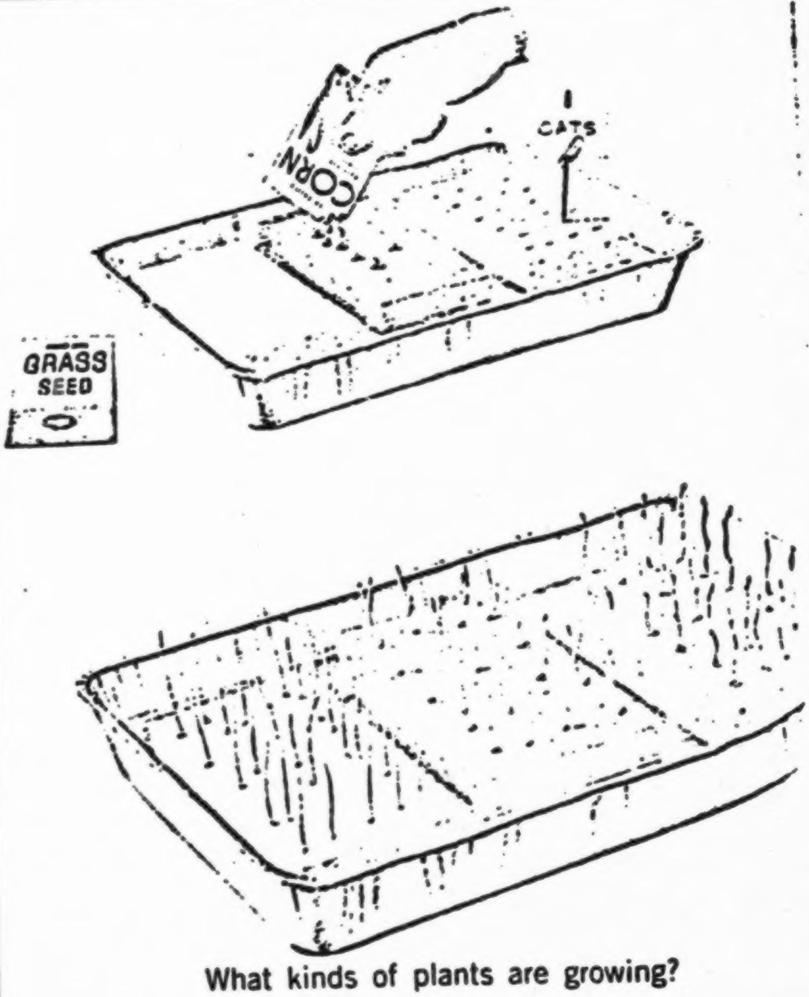
Develop the understanding that plants and seeds of the grass family are important sources of food.

Extending the Concept

Through Investigation. Get seeds of cereal plants (oats, corn, wheat, rye) from a feed store. Let children sow them on damp sponges, as shown on page 70.

Through Key Concept Words. Add *grass* to the Science Vocabulary Chart.

Through Activity. Put a handful of wheat seeds (or cracked wheat from a health food store) between two layers of clean cloth on a smooth stone or concrete base. Demonstrate how to use a hammer to pound the seeds. Shake the meal through a fine sieve (or flour sifter), and let children see that a kind of flour can be made from seeds.



What kinds of plants are growing?

UNIT SEVEN: PLANTS AND MORE PLANTS

METHODS OF PRESENTATION

6

Section 7: New Plants from Dispersed Seeds

CONCEPT
Organisms (living things) reproduce their own kind.

LESSON 9, page 72

SUBCONCEPT: Plants are dispersed to new environments by means of seeds.

Aim of the Lesson

To provide children with enough experiences to realize that new plants are started in new environments from seeds that are carried by animals and other agencies such as wind and water.

ADS FIELD
TRIP,
ENTIONS,
KS
QUESTIONS

Introducing the Lesson

Take children on a short field trip to discover plants growing in many kinds of places. Call attention to seeds and grasses in vacant lots, between rocks and cracks in pavement, and in other areas where obviously no one took the trouble to plant them. Lead children to wonder:

Why do so many kinds of plants grow in so many places?

Developing the Concept

(by emphasis on the subconcept)

1. Direct attention to the top picture on page 72. Call on someone to tell the story of what the squirrel is doing. Pass acorns around the class if specimens are available. To bring out the essential features of the picture, present questions about the source of the acorns, their relation to the *tree*, the time of year, and why the squirrel is burying the acorns. Develop these ideas:

Acorns are seeds of the oak tree.

Squirrels use acorns for food.

In the fall squirrels store acorns for winter use.

Some of the acorns buried in the ground remain there because of frozen ground, snow, or even forgetfulness on the part of the squirrel.

Now challenge the class by presenting this question: **If some of the acorns stay buried all winter, what happens to them when the snow melts in spring, the ground thaws, and the water soaks into the soil?**

To verify answers, refer children to the seedlings in the top picture. Identify the seedlings as young oak trees, and check for comprehension by presenting questions such as:

Why are young oak trees growing here?

What are the new oak trees growing from?

Can you explain how the acorns got "planted"?

Encourage answers that reveal the relation between seeds (acorns) buried by a squirrel and new oak trees.

2. Then direct attention to the picture at the bottom of the page. Call on individuals to tell what is happening in the left part of the picture. Try to bring out the following ideas:

The burs sticking to the boy's clothes are seeds.

The boy pulls off the seeds, which fall on the ground.

Some of the seeds grow into new plants that have burs.

The plant at the left of the picture is a full-grown plant with seeds (burs).

3. Almost every child will recognize the dandelion, and that the wind is blowing seeds from the head. Ask: **Do you think that new dandelion plants will grow near here? Do you think anyone planted dandelion seeds where these plants are growing?**

Through review develop the following understandings:

New plants grow in new places from seeds that are carried there by animals, by people, and by the wind.

Each plant is like the plant on which its seed grew.

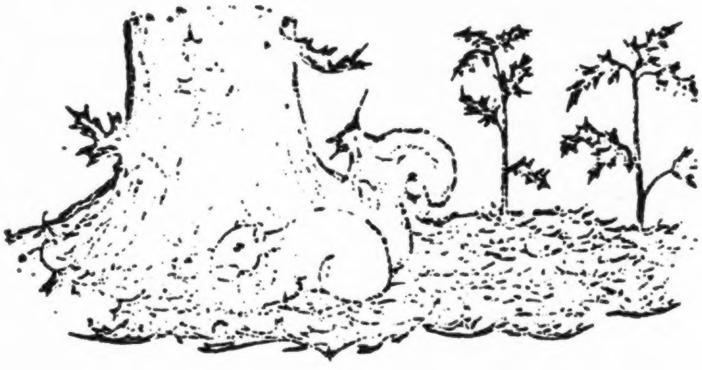
EXHIBITS OR DEMONSTRATES

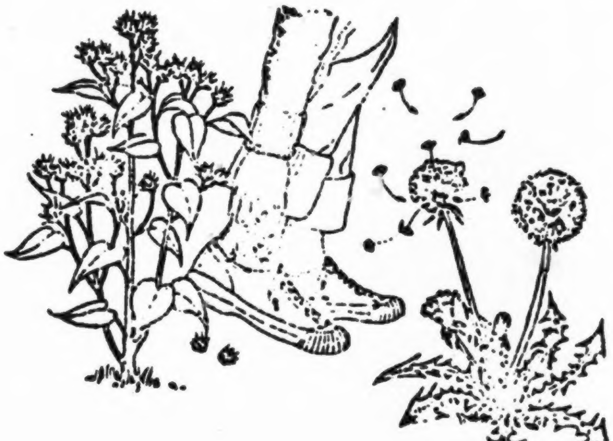
Extending the Concept

ASKS QUESTIONS

Through Investigation. Collect several intact dandelion seed heads. Pull out the "parachutes" and let children examine them through a magnifying glass to discover why the seeds float so easily on the air. Count aloud with the children as you remove the seeds. **What would happen if every seed grew into a new plant? Why do some not grow?**

Through Key Concept Words. Add *tree* to the Science Vocabulary Chart.





What is happening?

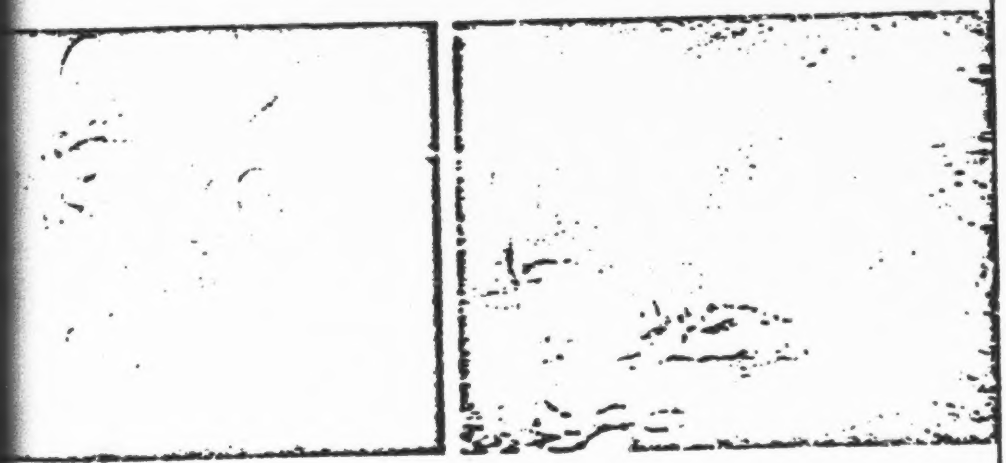
STUDENT TASK

nimals :

plants.

Some animals

eat other animals.



animals eat both plants and animals.

Discussion Questions

1. *Do you know what kind of an animal (page 26) this is? What is it eating?* A prairie dog; it is eating a dandelion. (NOTE: Have children guess the approximate size of this animal by comparing it with the dandelion.)

2. *What does the Alaskan brown bear have in his mouth?* Fish (salmon)

3. *Do you think the Alaskan brown bear eats many plants?* No; because of cold climate and rocky terrain, few plants grow in the region where these bears live. Hence, their diets are confined primarily to fish.

4. *What is the name of this animal that looks as if he is wearing a mask? What kinds of food does he eat?* A raccoon; he eats nuts, seeds, small mammals, and birds.

Special Activities

DESCRIBE, OBSERVE

1. Obtain a grasshopper and place it in a maraschino-cherry jar with rounded sides (the curved glass serves as a lens). Place a fresh blade of grass in the jar. Let children describe how the animal eats the grass.

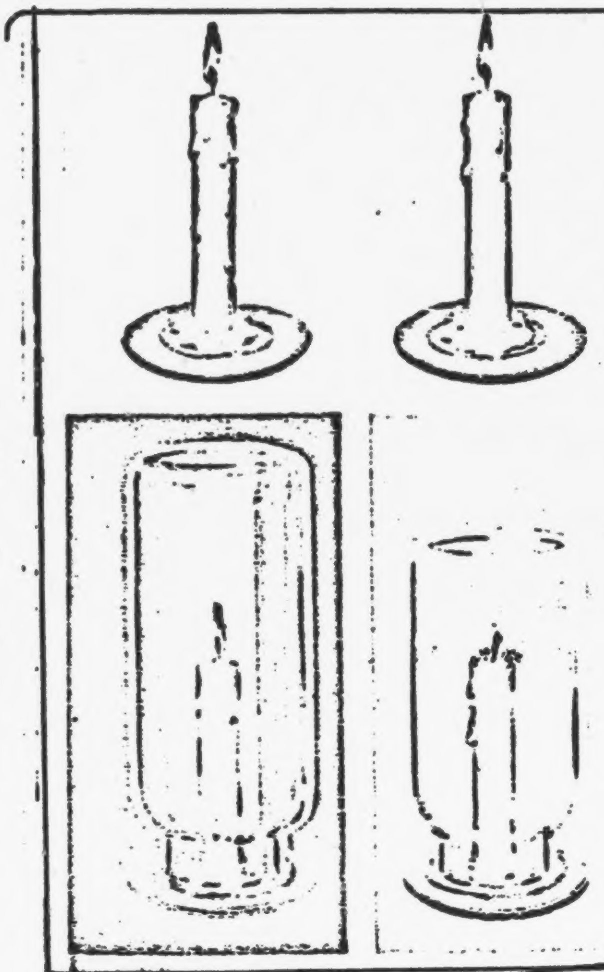
2. If it is possible to secure a hamster or white rat, have the children observe the kinds of food the animal eats, the shape of its teeth, and the way it eats.

3. Have the children keep a record of the food they eat in one day. Emphasize that everything they eat, even meat and milk, can be traced back to some green plant. Point out the dependency of all animals on green plants for a food supply.

4. Have a first-grader who has lost his two top front teeth describe the difficulty in eating such foods as corn on the cob and apples. Relate this difficulty to the relationship between food habits and tooth structure. Bring in pictures of the teeth of herbivores (sharp, broad, cutting teeth) and of carnivores (sharp, pointed, tearing teeth), and compare them.

5. Have children discuss the foods their pets eat. Compare the eating habits and body structures of various types of pets.

STUDENT TASK



FIND OUT!

WHAT IS NEEDED FOR A FIRE TO BURN?

EXPLAIN, OBSERVE

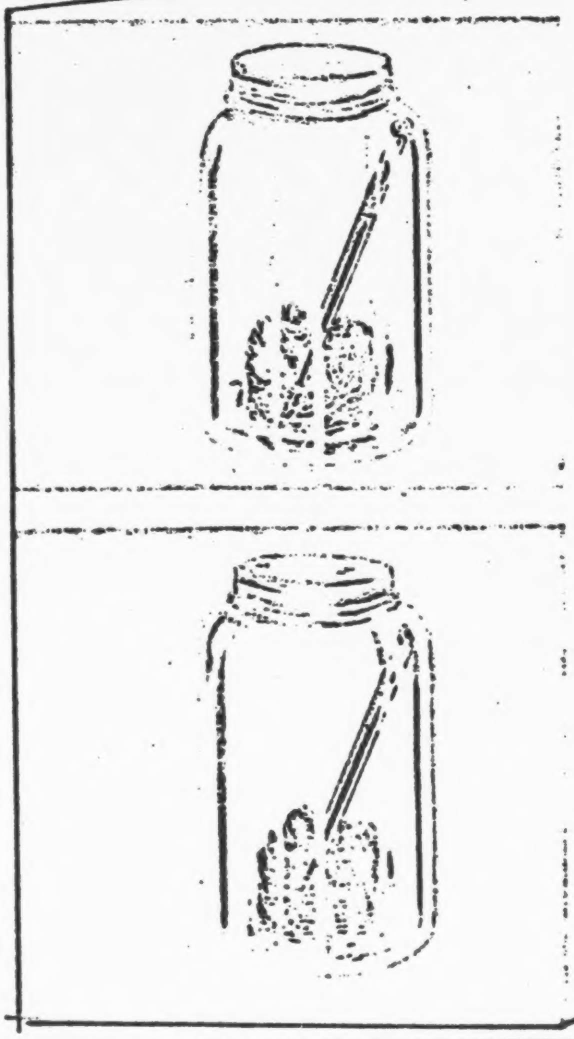
Your teacher may light two candles for you.

Put a little jar over one candle. Put a larger jar over the other candle.

What happens? Why?

The flames of both candles go out, but the candle under the smaller jar is extinguished first for it has less air.

GENERALIZATION: Air is needed for burning to take place.



FIND OUT!

HOW DO YOU KNOW THAT HEAT COMES FROM RUSTING?

MEASURE, VESTIGATE, EXPLAIN

Put a piece of steel wool and a little water in a jar. Put in a thermometer. See where the liquid in the tube is at first.

After a while, look at the thermometer again. Did the liquid in the tube go up? Why?

GENERALIZATION: ~~When oxidation takes place, heat is given~~ off.

STUDENT TASK

APPLY KNOWLEDGE TO NEW SITUATIONS

THINKING AHEAD IN SCIENCE

NOTE: See guide for responses and suggestions.

1. What kinds of things cannot be used as fuel for fire?
2. What is a fireproof building?
3. Where does the gas used in a kitchen stove come from?
4. What can you do to keep things from rusting?
5. What liquids are used in thermometers?

THINGS TO DO

NOTE: See guide for responses and suggestions.

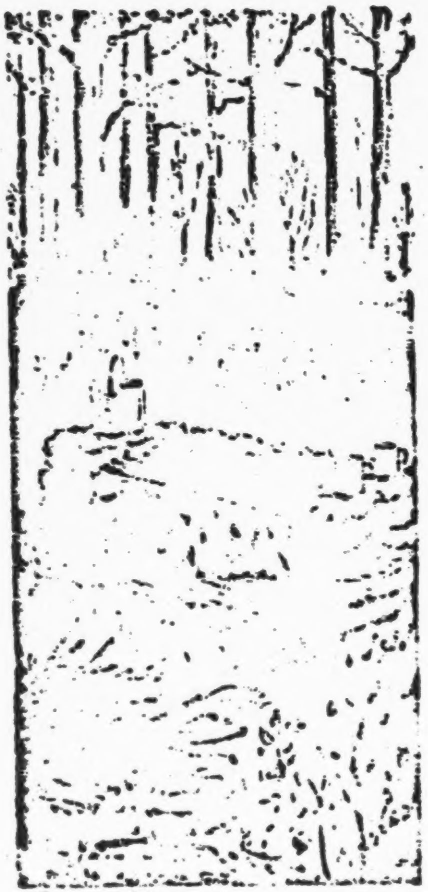
1. Find out different ways of putting out fires.
2. Find out how to keep safe from fire in your home.
3. Find out how a fire extinguisher works.

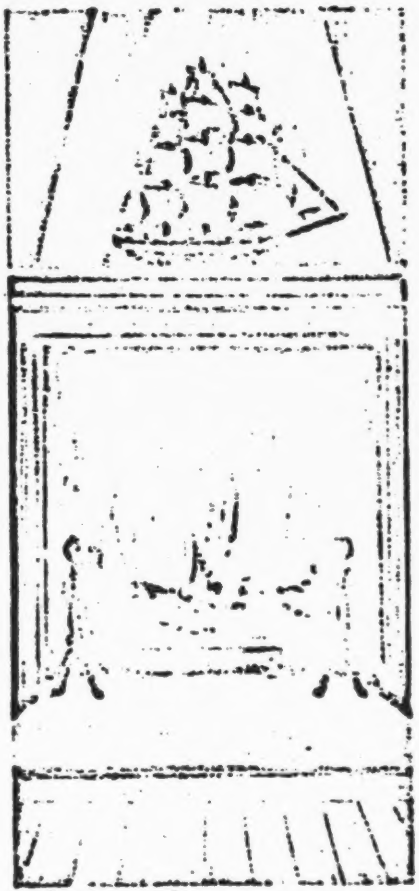
IMAGE OF SCIENCE

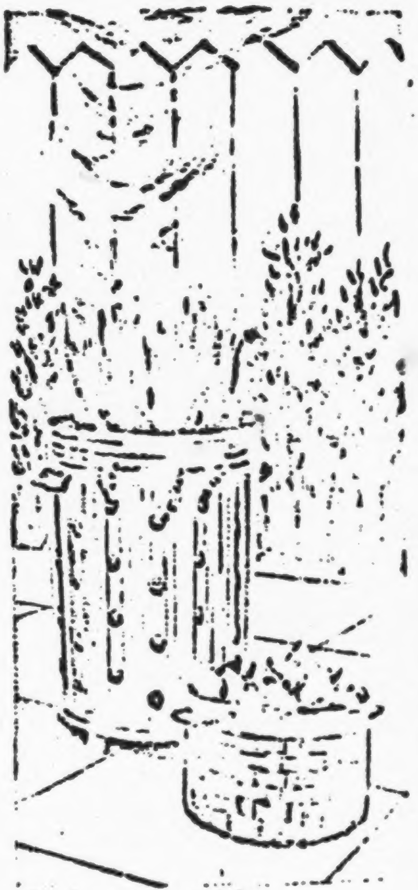
CONTROLLING THE ENVIRONMENT

How do people use fire?
They may use it for cooking.
They may use it to keep warm.

In what ways is fire used
in these pictures?


for cooking


for warmth


for burning trash

Many times, people do not know
how to use fire. Then fire burns
things that should not burn.
People are often hurt by fire, too.

SUGGESTION: Have children discuss dangers involved in using fire and safeguards that have to be followed.

CONTROLLING THE ENVIRONMENT

The picture shows that someone did not know how to use fire. What happened?

SUGGESTION: Discuss various ways that forest fires may start and how they can be prevented. If some children have had camping experiences, have them describe how campfires are put out.

12

IMAGE OF SCIENCE

nswer to Question
hy do these trees grow only part of e year? The temperature is not high ough during the winter (not enough ar radiation).

Trees on the outside are not growing.

Why do these trees grow only part of the year?

Discussion Questions

1. *Have you ever visited a greenhouse? What was it like inside?* Answers will vary, but should indicate the conditions of moisture, warmth, and brightness, and probably the characteristic odors of growing plants.

2. *How is this man caring for the plants in the greenhouse?* He is watering them.

3. *In what other ways may he care for these plants?* Among others, by keeping the greenhouse warm (note the chimney from a small stove in the background); by fertilizing the soil; by cutting and transplanting the plants when they grow larger.

4. *Why do florists grow plants in greenhouses?* Plants can be grown almost all year round in a greenhouse, since the "weather" inside is controlled. Also, plants can be protected from insects and disease more easily inside than outside.

5. *Does your mother have plants growing inside your home? How does she take care of them?* She probably waters them, places them in a sunny spot, keeps them out of cold drafts but where it does not become too hot, fertilizes the soil, etc.

Special Activities

1. Obtain some old seed catalogues. Let the children cut out pictures of the many kinds of flowering plants to apprise them of the variety of angiosperms.

2. If there is a beekeeper in the community, ask him to tell the children about his activities, stressing the function of bees in pollinating flowers and fruit trees. Have him describe how bees and other insects and birds are attracted by the bright colors and odors of the flowers.

3. Plan a visit to a greenhouse to note the care given to plants and to observe the varieties of plants grown. This activity is especially interesting in winter or early spring.

4. Provide each child with a small flowerpot and a small flowering plant, such as a marigold. Have him care for the plant. Discuss the kinds of care required.

GROWING THINGS

IMAGE OF SCIENCE

13

M.C.O.

the air that is needed for most burning, but in most ordinary cases the oxygen for burning is obtained from the air.

- The substance shown burning on page 81 is "Sterno." Sterno is often used as a source of heat on camping trips. It can be obtained at camping supply stores, at war surplus stores, and at drugstores. A candle burning in a bowl can be substituted for the Sterno in the activity illustrated on page 81.

The pictures on page 81 show what happens when a fire is cut off from its source of air. In a variation of this activity, have the children try to predict how far over the bowl the cover can be pushed without making the flame go out. After obtaining the predictions, try it and see.

- One of the ways to make fuel burn faster is to increase the amount of air around the flame. We sometimes fan glowing coals in order to make them flare up into flames. The boy scout trying to start a campfire may blow on glowing embers in order to make the fire burn faster. Sometimes, bellows are used to start a fire in a fireplace. The blacksmith used a bellows to make the coals in his forge glow when he wanted a hot fire to heat his metals. In all of these cases, a fire is made to burn faster by supplying it with more air.

When substances burn, they are combining with oxygen in the air. Burning is a fast oxidation in which heat and light are given off. Fire is an example of a fast chemical reaction.

- Children can learn a great deal about burning by observing a flame of a burning candle or a gas burner such as a Bunsen burner. The burning in such a flame actually takes place at the edge of the flame. Children can see a dark region in the center of the flame. This region is filled with gas from the candle. This gas doesn't burn because it doesn't have access to a supply of air. If the lower end of a piece of glass tubing is held in this dark region, some of the gas will move up the glass tubing. If a match is held next to the upper end of the glass tubing, the gas will ignite, and a small flame will form at the upper end of the tubing.

Procedure (pp. 84-85)

Everyone, including children, should learn how to put out a fire. In general, fires are put out by depriving the flame of something that is needed for burning. For example, a candle flame can be extinguished by putting something over it to deprive it of oxygen, as is shown on page 84.

- You may wish to discuss with the children how they could put out fires by depriving the fire of air. For example, if someone's clothes should happen to catch on fire, one of the best ways to stop such a fire is to quickly wrap a blanket around him. The fire goes out because the supply of air is cut off. Some high school chemistry laboratories have blanket rolls that are readily available if a sleeve or other garment should catch on fire. If there is such a device available in the community, you may want to take the children to see it.

- Another way to remove the supply of air from a flame is to cover it with soil or sand. This is a common way to extinguish campfires. It is also a way to put out small grass fires that sometimes start during a dry period. Make certain that the children understand the scientific principle underlying this method: the fire is being deprived of one of the requirements for burning.

- Try to find out how the school building is protected from fire. Many buildings have automatic sprinklers that spray water throughout the room if a fire should start. Usually, there are fire extinguishers available in strategic places. Many school buildings have steel fire doors, in corridors, that are designed to prevent fires from spreading throughout a building. You can consult the school custodian or plant manager to get

MAKING CAREFUL OBSERVATIONS

IMAGE OF SCIENCE

energy of the atoms or molecules that make up a substance. However, most substances expand when they are heated and contract when they are cooled. The liquid in a thermometer, for example, expands when it is heated and contracts when it is cooled. We can use this property of such a substance to measure the temperature.

It is well to review with the youngsters the concepts of hotness and coldness. The pictures on page 90 show places that have radically different temperatures.

• On page 91 are shown various kinds of thermometers that are used to measure temperatures. Obtain as many of these different kinds of thermometers as possible, and show them to the children. Have them put their fingers on the bulb of the ordinary air thermometer and watch the liquid in the thermometer rise. Have them note that the liquid "falls" when they take their fingers away.

MAKING MEASUREMENTS

• This is a good time to give children practice in reading thermometers. Draw a large thermometer on a piece of tagboard. Indicate numbers at intervals of 10, from 0 to 120, along the side of the sketch so they resemble numbers on a real thermometer. Use a red ribbon or piece of paper to simulate the liquid in a thermometer. Move the ribbon up and down on the tagboard thermometer, and have the children call off the temperatures that are indicated. Following this, give them practice in reading real thermometers.

• Discuss with the children various situations in which it is important to know what the temperature is and how to control it. Of course, it is important to control the temperatures in our homes and classrooms. On page 92 the picture shows how the temperatures in an oven are measured. Ask the children why it is important to have the right temperature when food is being cooked in the oven.

FIND OUT!
(p. 93)

HOW DOES A THERMOMETER SHOW CHANGE IN TEMPERATURE?

Materials Needed:
thermometer
bowl
ice cubes

Have the children notice the direction in which the liquid in the thermometer moves when it is cooled and when it is heated. What is the lowest temperature indicated by the thermometer when it is placed in the ice? What is the highest temperature that is indicated after the ice melts?

FIND OUT!
(p. 93)

HOW DOES THE TEMPERATURE CHANGE FROM DAY TO DAY?

Materials Needed:
outdoor thermometer
chart paper

This is an excellent activity for giving children practice in reading thermometers as well as for helping them to become aware of how temperatures may change from day to day.

In order to make the temperature record of some value, it is desirable to observe the temperature at about the same time each day. Each child should have experience in reading the thermometer.

Key to
LOOKING BACK
(p. 94)

1. The temperature rises when things get hotter.
2. The temperature becomes lower when things get colder.

5

MODE

swer to Question

y do these trees grow only part of year? The temperature is not high ugh during the winter (not enough r radiation).

Trees on the outside are not growing.

Why do these trees grow only part of the year?

Discussion Questions

1. *Have you ever visited a greenhouse? What was it like inside?* Answers will vary, but should indicate the conditions of moisture, warmth, and brightness, and probably the characteristic odors of growing plants.

2. *How is this man caring for the plants in the greenhouse?* He is watering them.

3. *In what other ways may he care for these plants?* Among others, by keeping the greenhouse warm (note the chimney from a small stove in the background); by fertilizing the soil; by cutting and transplanting the plants when they grow larger.

4. *Why do florists grow plants in greenhouses?* Plants can be grown almost all year round in a greenhouse, since the "weather" inside is controlled. Also, plants can be protected from insects and disease more easily inside than outside.

5. *Does your mother have plants growing inside your home? How does she take care of them?* She probably waters them, places them in a sunny spot, keeps them out of cold drafts but where it does not become too hot, fertilizes the soil, etc.

Special Activities

1. Obtain some old seed catalogues. Let the children cut out pictures of the many kinds of flowering plants to apprise them of the variety of angiosperms.

2. If there is a beekeeper in the community, ask him to tell the children about his activities, stressing the function of bees in pollinating flowers and fruit trees. Have him describe how bees and other insects and birds are attracted by the bright colors and odors of the flowers.

FUNCTION

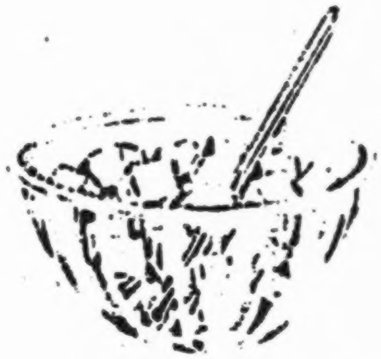
3. Plan a visit to a greenhouse to note the care given to plants and to observe the varieties of plants grown. This activity is especially interesting in winter or early spring.

4. Provide each child with a small flowerpot and a small flowering plant, such as a marigold. Have him care for the plant. Discuss the kinds of care required.

MODE

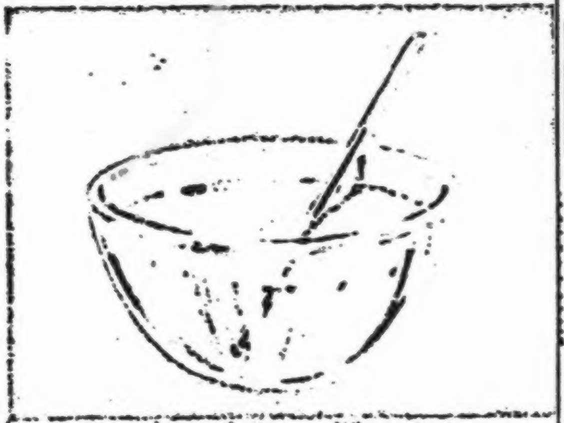
IND OUT!

OW DOES A THERMOMETER
HOW CHANGE IN TEMPERATURE?



Put some ice cubes in a bowl ith a thermometer. See where he liquid in the glass tube is.

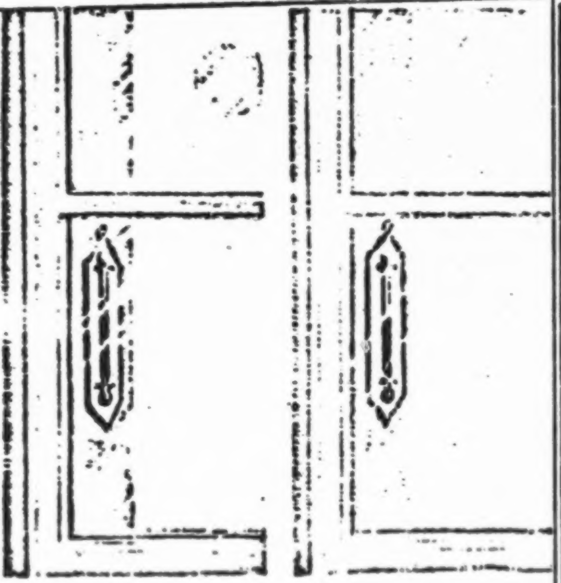
Now let all the ice melt, nd wait a while. s the liquid in the tube igher or lower now?



ENERALIZATION: When the liquid in a thermometer is heated, it expands and rises. When it is oled, it contracts and moves down in the tube.

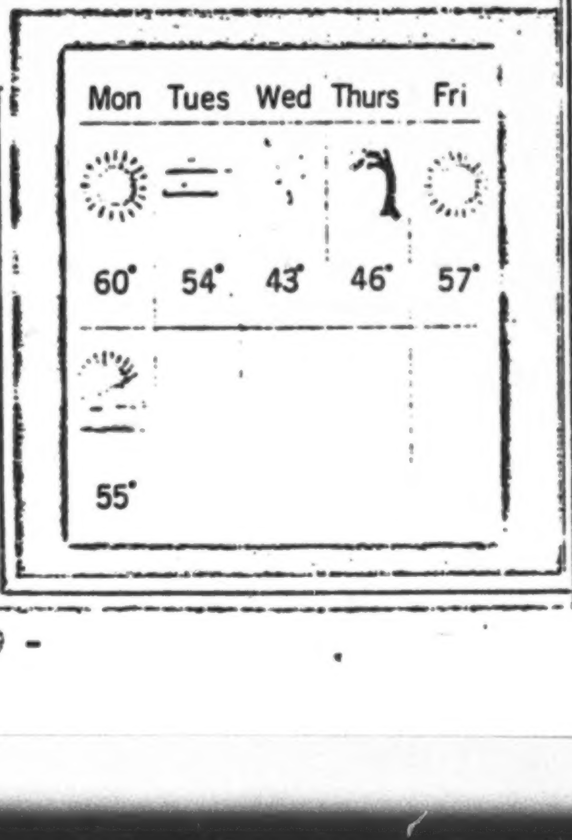
IND OUT!

IOW DOES THE TEMPERATURE
HANGE FROM DAY TO DAY?



Read an outside thermometer t the same time each day. Vrite down the temperature ach day for a week.

When was the temperature nigher? When was it lower?



ENERALIZATION: Outside air temperatures tend to change uring the course of a day.

OTE: The weather is indicated on the chart with sketches. his is an effective method of record keeping with young hildren.

RELATIONSHIP

LOCATION OF AU ωA	FORMAT OF AU	ADVERBIAL DESCRIPTOR OF AU	METHOD OF PRESENTATION OF AU	STUDENT TASK EXPECTED BY AU	IMAGE OF SCIENCE GIVEN BY AU	AU	AU	
ABC-65-1-(9-10)-4-G31	TGO	3	Gives, [illegible] Directions	Observe, Consider DESC.	Making Careful Observations	Behavior, Structure, Comp.	Fire	
p.74-5	TPc2Dc4Pb2Q6	3	Presents Information f Anal.	Observe, Decide	Controlling the Environment	Relationship	Fire	
p.76-7	TPcDc3Q3	3	Asks Questions Describes	Consider, Recognize	CTE	Function	Fire	
(8-10) G32	TGO	3	Gives A.Q. EXH Directions	Observe, Consider	Working Carefully MCO, SpL	Function	Fuels	
p.78-80	TPc3Pb2Dc6Q4	3	Mentions, Asks Questions	Decide, Consider	Facts, CTE	Function Classification	Fuels	
(6) G33	TGO	3	Gives EXH. Directions	Observe	MCO	Structure Interaction	Fire	
p.81-3	TBc7Pc3Q5	3	Describes, Explains	Comprehend	Facts, SpL	Interaction	Fire Oxidation	
(3) G34	TGO	3	LEAD FIELD TRIP [illegible]	Take a Field Trip	CTE	Function	Fire	
p.84-5	TDc9Q3	3	Explains, Describes	Comprehend	Facts, CTE	Interaction	Fire	
(6) G34	TGO	3	Gives AQ. EXH. Directions	Observe, Decide	Verifying Things	Process Interaction	Rusting ←	nothing about need for water
(7) G34	TGO	2	A.Q. Suggests	Hypothesize, Investigate	Attacking Problems	Process Interaction	Rusting	
p.86-7	TPcQ7	3	Describes	Comprehend	Facts, SpL	Process, Interaction	Rusting	
110 p.88	AQ3Dc4	4	Gives Directions	Observe, Explain	Verifying Things	Interaction Process, Relation.	Fire	Gives Away Answers
p. 88	AQ3Dc2	4	Gives Directions	Investigate Explain, Measure	Verifying Things	Process Interaction	Rusting	Gives Away Answers
p.89	Q8	3	Asks Questions	Recall	CTE, SpL	Function Classification	Fire, Rusting Oxidation	
p.89	Q3	4	Asks Questions	Apply Knowledge to New Sit.	CTE	Process	Fuel, Fire Rusting	Q no. 3 Poor
(3) G36	TGO	3	Gives Directions	Observe Investigate	Making Measurements	Relationship	Temperature	
(4) G36	TGO	3	Gives EXH., A.Q. Directions	Measure Observe	Making Measurements	Stucture	Temperature	
p.90-2	TDc2Pb10Q8	3	Describes, Explains	Consider, Decide Comprehend	Making Measurements	Process, Relat. Classification	Temperature	

OF U #★	FORMAT OF AU	ADVERBIAL DESCRIPTOR OF AU	METHOD OF PRESENTATION OF AU	STUDENT TASK EXPECTED BY AU	IMAGE OF SCIENCE GIVEN BY AU	MODE OF AU	TOPIC OF AU	COMMENT
ABC-65-1-4-p.93	ADc2Q2	4	Gives Directions	Investigate Measure	Verifying Things	Transformation Relationship	Temperature	Gives Aw Answer
p.93	ADc3Q3	4	Gives Directions	Keep a Record Decide, Measure	Verifying Things	Relationship	Temperature	Gives Aw Answer
p.94	Q5	4	Asks Questions	Recall	Making Measurements	Relationship	Temperature	Q no. 4 Poor
p.94	Q5	3	Asks Questions	Apply Knowledge to New Sit.	Making Measurements	Relationship	Temperature	
p.95	T	4	Summarizes	Memorize	Facts	Relationship, Class., Inter	Oxidation, Fire, Rusting	
p.96	Q5	3	Asks Questions	Apply Knowledge to New Sit.	CTE	Classification Origin, Inter.	Temperature Fire, Rusting	
p.96	A3	3	Suggests	Interview Authority	CTE	Relationship Function	Fire	

LOCATION OF AU ■	FORMAT OF AU	ADVERBIAL DESCRIPTOR OF AU	METHOD OF PRESENTATION OF AU	STUDENT TASK EXPECTED BY AU	IMAGE OF SCIENCE GIVEN BY AU	MODE OF AU	TOPIC OF AU	COMMENT
SB-65-1-8-p.56-7	TPcQ	3	DESCRIBES ASKS QUESTION	CONSIDER RECALL	NATURE STUDY	CLASSIFICATION STRUCTURE	PLANTS	
[illegible](sn1) p57	TCO	3	GIVES A.Q. [illegible] LISTS	[illegible] RECALL [illegible]	NATURE STUDY	EXISTENCE	PLANTS	
[illegible](sn2) p57	TCO	3	GIVES L.F.T. [illegible] LISTS	TFT - OBSERVE	NATURE STUDY	EXISTENCE DISTRIBUTION	PLANTS	
[illegible](sn3) p57	TCO	3	GIVES EXH. [illegible] L.D.	OBSERVE	NATURE STUDY	STRUCTURE	TREES	
[illegible](sn4) p57	TCO	3	GIVES L.D. [illegible]	DESCRIBE CONSTRUCT PICTURE	NATURE STUDY	TRANSFORMATION	PLANTS	
p59-9	TPc2Q2	3	DESCRIBES ASKS QUESTIONS	CONSIDER DECIDE, RECALL	NATURE STUDY	FUNCTION, RE. DEVELOPMENT	PLANTS FUNGI	
[illegible](sn1) p59	TCO	3	GIVES EXH. [illegible]	OBSERVE	[illegible] GROWING THINGS	DEVELOPMENT	FUNGI	
p[illegible]-1	TPc2Q2	3	DESCRIBES ASKS QUESTIONS	CONSIDER, DECIDE, RECALL	CONTROLLING THE ENVIRONMENT	STRUCTURE FUNCTION	TREES VEGETABLES	
[illegible](sn1) p61	TCO	3	GIVES DIRECTIONS	MAKE COLLECTION ORGANIZE	CLASSIFYING THINGS	CLASSIFICATION STRUCTURE	PLANTS	
[illegible](sn2) p61	TCO	3	[illegible] EXH. [illegible]	OBSERVE	CONTROLLING THE ENVIRONMENT	FUNCTION	PLANTS & PRODUCTS	
[illegible](sn3) p61	TCO	3	G.D. [illegible] EXH L.D.	PRESENT REPORT	CONTROLLING THE ENVIRONMENT	RELATIONSHIP	PLANTS, AND PLANT PRODUCTS	
[illegible](sn4) p61	TCO	3	[illegible] EXH [illegible]	OBSERVE	CONTROLLING THE ENVIRONMENT	PROCESS	PLANT PRODUCTS	
p62-3	TP3Q2	3	MENTIONS ASKS QUESTIONS	CONSIDER DECIDE	NATURE STUDY	DISTRIBUTION	SEEDS	
[illegible](sn1) p63	TCO	3	GIVES [illegible] EXH. [illegible]	OBSERVE	NATURE STUDY	DISTRIBUTION	SEEDS	
[illegible](sn2) p63	TCO	3	GIVES EXH. L.D. [illegible]	OBSERVE CONSIDER	GROWING THINGS M.C.C.	RELATIONSHIP BEHAVIOR, DE.	SEEDS HEAT TEMP.	
[illegible](sn3) p63	TCO	3	GIVES EXH. L.D. [illegible]	OBSERVE CONSIDER	GROWING THINGS M.C.C.	RELATIONSHIP, DI. DEVELOPMENT, DE.	SEEDS	
p64-5	TPc2	3	DESCRIBES	COMPREHEND	NATURE STUDY	STRUCTURE DISTRIBUTION	PLANTS, MOSSES MICROSCOPIC PLANTS	
[illegible](sn1) p65	TCO	3	GIVES L.F.T. EXH. [illegible]	TFT - MC	NATURE STUDY	DISTRIBUTION	MOSSES TERRARIUM	
[illegible](sn2) p65	TCO	2	[illegible] EXH. [illegible]	OBSERVE	NATURE STUDY	EXISTENCE DISTRIBUTION	MICROSCOPIC PLANTS	
[illegible](sn3) p65	TCO	3	GIVES, EXP. DIRECTIONS	OBSERVE, COMPREHEND	MCC	EXISTENCE	MICROSCOPIC PLANTS	

LOCATION OF AU	FORMAT OF AU	ADVERBIAL DESCRIPTOR OF AU	METHOD OF PRESENTATION OF AU	STUDENT TASK EXPECTED BY AU	IMAGE OF SCIENCE GIVEN BY AU	AU	AU	
iö · 65-1- 4-p.66-7	TPcQ	3	DISCUSSES	CONSIDER DECIDE	CTE	DEVELOPMENT, DISTRIBUTION	FLOWERS TREES	
(SA1) p67	TCO	3	GIVES DIRECTIONS	MAKE COLLECTION	NATURE STUDY	CLASSIFICATION, EXISTENCE	FLOWERS	
(SA2) p67	TCO	3	DESCRIBE [illegible]	INTERVIEW AUTHORITY	CTE NATURE STUDY	FUNCTION	BEES, TREES, FLOWERS	
(SA3) p67	TCO	3	LEAD FIELD TRIP [illegible]	TFT OBSERVE	CTE	DISTRIBUTION, DEVELOPMENT	PLANTS	
(SA4) p67	TCO	3	GIVES DIRECTIONS, LEADS DISCUSSION	AKNS	GROWING THINGS	DEVELOPMENT	FLOWERS	
p68-9	TPc2Q3	3	MENTIONS ASKS QUESTIONS	CONSIDER DECIDE	NATURE STUDY	RELATIONSHIP, DEVELOPMENT	LIGHT PLANTS	
(SA1) p69	TCO	3	L.F.T. [illegible]	TFT-OBSERVE	NATURE STUDY	STRUCTURE, RELATIONSHIP	LIGHT PLANTS	
(SA2) p69	TCO	3	[illegible] L.F.T., L.D.	TFT-OBSERVE	NATURE STUDY	CLASSIFICATION, RELATIONSHIP, DI.	PLANTS LIGHT	
p70-1	TPc2Q2	3	MENTIONS ASKS QUESTIONS	CONSIDER DECIDE	NATURE STUDY	DISTRIBUTION RELATIONSHIP	PLANTS, WATER SOIL, TEMP	
(SA1) p71	TCO	3	GIVES DIRECTIONS	AKNS PLAN	GROWING THINGS	DEVELOPMENT	TERRARIUM CACTI	
(SA2) p71	TCO	3	[illegible] EXH., L.D. [illegible]	OBSERVE CONSIDER	GROWING THINGS M.C.C.	RELATIONSHIP DEVELOPMENT	PLANTS [illegible] TEMP.	
p72-3	TPcQ2	3	MENTIONS ASKS QUESTIONS	CONSIDER RECALL, DECIDE	NATURE STUDY M.C.C.	DISTRIBUTION DEVELOPMENT	ALGAE	
(SA1) p73	TCO	3	GIVES EXH. [illegible]	OBSERVE	NATURE STUDY	DEVELOPMENT	WEEDS WATER	
(SA2) p73	TCO	3	EXHIBIT [illegible]	OBSERVE	M.C.C. NATURE STUDY	EXISTENCE	ALGAE	
(SA3) p73	TCO	3	[illegible] EXHIBIT	OBSERVE	NATURE STUDY M.C.C.	RELATIONSHIP BEHAVIOR	ALGAE SNAILS	
p74-[illegible]	TPcP1Q2	3	MENTIONS ASKS QUESTIONS	CONSIDER DECIDE	C.T.E.	RELATIONSHIP	PLANTS INSECTS	
(SA1) p75	TCO	3	GIVES EXH. L.D. [illegible]	COMPREHEND	C.T.E.	RELATIONSHIP FUNCTION	INSECTS, INSECTICIDES PLANTS	
(SA2) p7[illegible]	TCO	3	GIVES EXH. [illegible]	OBSERVE DESCRIBE	NATURE STUDY	RELATIONSHIP BEHAVIOR	INSECTS GRASSES	

LOCATION OF AU ◘	FORMAT OF AU	ADVERBIAL DESCRIPTOR OF AU	PRESENTATION OF AU	EXPECTED BY AU	SCIENCE GIVEN BY AU	AU	AU	
[illegible]-66-1- [illegible]) 7- p.62	TGC	3	[illegible] EXH. A.Q. [illegible]	OBSERVE RECOGNIZE	NATURE STUDY	ORIGIN	SEEDS	
p62	TD.3	3	MENTIONS	CONSIDER	NATURE STUDY	ORIGIN DEVELOPMENT	SEEDS, PLANTS	
(EC1) p62	TGC	3	EXHIBIT GIVE DIRECTIONS	OBSERVE	NATURE STUDY M.C.O.	ORIGIN	SEEDS	
(EC2) p62	TGC	3	P.V.E., LISTS	MEMORIZE	S.P.L.	DEVELOPMENT	SEEDS, PLANTS	
(EC3) p62	TGC	3	EXHIBIT ASKS DIRECTION	OBSERVE COMPREHEND	NATURE STUDY	DEVELOPMENT ORIGIN	PLANTS, SEEDS	
(EC4) p62	TGC	3	GIVE DIRECTIONS EXHIBIT	MAKE COLLECTION	CONTROLLING THE ENVIRONMENT	FUNCTION	PLANT PRODUCTS	
(INTRO.) p63	TGC	3	ASKS QUESTIONS	RECALL DECIDE	NATURE STUDY	DEVELOPMENT	PLANTS SEEDS	
p63	AQ.De4	3	ASKS QUESTION GIVES DIRECTIONS	INVESTIGATE	VERIFYING THINGS	DEVELOPMENT ORIGIN	SEEDS	
(EC1) p63	TGC	3	GIVES DIRECTIONS	INVESTIGATE	GROWING THINGS M.C.O	DEVELOPMENT	SEEDS, PLANTS	
(EC2) p63	TGC	3	GIVES DIRECTIONS	INVESTIGATE	GROWING THINGS	DEVELOPMENT	SEEDS, PLANTS	
(EC3) p63	TGC	3	[illegible] FIELD TRIP GIVES DIRECTIONS	TAKE FIELD TRIP OBSERVE	NATURE STUDY	STRUCTURE	PLANTS	
(EC4) p63	TGC	3	P.V.E., LISTS	MEMORIZE	S.P.L.	DEVELOPMENT	PLANTS	
(INTRO.) p64	TGC	3	EXHIBIT, LIST ASK QUESTION	OBSERVE DECIDE	NATURE STUDY	ORIGIN DEVELOPMENT	PLANTS	
p64-5	Q2 De5	3	ASKS QUESTIONS P.I.A.	OBSERVE DECIDE	CONTROLLING THE ENVIRONMENT	DEVELOPMENT	PLANTS	
(EC1) p65	TGC	3	GIVES DIRECTIONS EXHIBIT	MAKE COLLECTION COMPREHEND	[illegible] C.T.E.	FUNCTION STRUCTURE	VEGETABLES	
(EC2) p65	TGC	3	P.V.E., LISTS	MEMORIZE	S.P.L.	DEVELOPMENT	PLANTS	
(EC3) p65	TGC	3	EXHIBIT GIVES DIRECTIONS	INVESTIGATE	GROWING THINGS	DEVELOPMENT	PLANTS	
(INTRO.) p66	TGC	3	ASK QUESTIONS, [illegible], EXH.	OBSERVE, DECIDE, COMPREHEND	GROWING THINGS	STRUCTURAL, ORIGIN, DEVELOPMENT	PLANTS, SEEDS	
p66-7	Q2 De5	3	ASKS QUESTIONS P.I.A.	OBSERVE, CONSIDER, DECIDE	GROWING THINGS	ORIGIN DEVELOPMENT	PLANTS	
(EC1) p67	TGC	3	GIVES DIRECTIONS EXHIBITS	[illegible]	GROWING THINGS	DEVELOPMENT	PLANTS	
(EC2) p67	TGC	3	GIVES DIRECTIONS	[illegible]	GROWING THINGS	DEVELOPMENT ORIGIN	PLANTS	
(EC3) p67	TGC	3	EXHIBITS	OBSERVE	GROWING THINGS	DEVELOPMENT ORIGIN	PLANTS	

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LOCATION OF AU	FORMAT OF AU	ADVERBIAL DESCRIPTOR OF AU	METHOD OF PRESENTATION OF AU	STUDENT TASK EXPECTED BY AU	IMAGE OF SCIENCE GIVEN BY AU	MODE OF AU	TOPIC OF AU	COMMENT
HOW-(L-1-EC4) 9-p.61	TGC	3	EXHIBIT	OBSERVE	GROWING THINGS	DEVELOPMENT	PLANTS	
(EC5) p.61	TGC	3	EXHIBIT	OBSERVE	GROWING THINGS	DEVELOPMENT	PLANTS	
(EC1) p.61	TGC	3	PVE LISTS	MEMORIZE	Sp.L.	STRUCTURE	PLANTS	
(INTRO) p.65	TGC	3	EXHIBIT ASKS QUESTION	OBSERVE	MAKING CAREFUL OBSERVATIONS	EXISTENCE	MOSSES FUNGI	
p.65	Q.D.4	3	ASKS QUESTION P.E.A.	OBSERVE DECIDE	GROWING THINGS	EXISTENCE, STRUCTURE, DEVELOPMENT	FUNGI	
(EC1) p.65	TGC	3	PVE LISTS	MEMORIZE	Sp.L.		FUNGI	
(EC2) p.65	TGC	3	GIVES DIRECTIONS	MAKE COLLECTION	GROWING THINGS	DEVELOPMENT	FUNGI	
(INTRO) p.69	TGC	3	EXHIBIT ASKS QUESTIONS	OBSERVE	MAKING CAREFUL OBSERVATIONS C.T.E	DEVELOPMENT ORIGIN	FUNGI	
p.69	Q.D.3	3	GIVES DIRECTIONS ASKS QUESTION	INVESTIGATE	GROWING THINGS	DEVELOPMENT	FUNGI	
(EC1) p.69	TGC	3	DEFINES DESCRIBES	COMPREHEND	Sp.L. NATURE STUDY	ORIGIN, STRUCTURE DISTRIBUTION, D.	FUNGI	
(INTRO) p.70	TGC	3	EXHIBIT, DESCRIBE ASKS QUESTION, L.D	OBSERVE, WONDER	NATURE STUDY	ORIGIN DEVELOPMENT	GRASSES	
p.70	Q.D.2	3	ASKS QUESTION P.E.A.	OBSERVE, DECIDE	GROWING THINGS	ORIGIN DEVELOPMENT	GRASSES SEEDS	
(EC1) p.70	TGC	3	GIVES DIRECTIONS	INVESTIGATE	GROWING THINGS	ORIGIN DEVELOPMENT	GRASSES, SEEDS	
(EC2) p.70	TGC	3	PVE LISTS	MEMORIZE	Sp.L.		GRASSES	
(EC3) p.70	TGC	3	EXHIBIT	OBSERVE RECOGNIZE	C.T.E.	PROCESS	PLANT PRODUCTS	
(INTRO) p.71	TGC	3	EXHIBIT A.G. READ DISCUSSION	RECALL COMPREHEND	CLASSIFYING TH.	EXISTENCE, FUNCTION	FRUITS, SEEDS	
p.71	TGC Q.D.4	3	ASKS QUESTION P.E.A.	OBSERVE, DECIDE	GROWING THINGS	DEVELOPMENT	PLANTS	
(EC1) p.71	TGC	3	EXHIBIT, EXPLAIN	OBSERVE, COMPREHEND	GROWING THINGS	DEVELOPMENT STRUCTURE	PLANTS	
(EC2) p.71	TGC	3	PVE LISTS	MEMORIZE	Sp.L.		FRUITS	
(INTRO) p.72	TGC	3	READ FIELD TRIP ARTICLE, A.G	MAKE FIELD TRIP, [illegible]	NATURE STUDY	EXISTENCE DISTRIBUTION	PLANTS	
p.72	Q.D.3	3	ASKS QUESTION P.E.A	OBSERVE, DECIDE	NATURE STUDY	DISTRIBUTION	SEEDS	
(EC1) p.72	TGC	3	EXHIBIT A.G	OBSERVE, DECIDE	NATURE STUDY	DISTRIBUTION	SEEDS	
(EC[illegible]) p.72	TGC	3	PVE LISTS	MEMORIZE	Sp.L.		TREES	

OF AU #	AU	DESCRIPTOR OF AU	PRESENTATION OF AU	EXPECTED BY AU	SCIENCE GIVEN BY AU	AU	AU	
[illegible] 7- p.73	TGO	3	EXHIBIT, L.D., [illegible]	WONDERING, OBSERVE	NATURE STUDY	FUNCTION	VEGETABLES SEEDS	
p.73	Q) Dcy	3	ASKS QUESTION GIVES DIRECTIONS	INVESTIGATE	GROWING THINGS	RELATIONSHIP DEVELOPMENT	PLANTS, LIGHT	
(EC1) p.73	TGO	3	GIVES DIRECTIONS	INVESTIGATE	GROWING THINGS	RELATIONSHIP DEVELOPMENT	PLANTS, LIGHT	
(EC2) p.73	TGO	3	P.V.E., LISTS	MEMORIZE	S.P.L.	ORIGIN	SEEDS	
[illegible]) p.74	TGO	3	LEADS DISCUSSION EXHIBIT, A.C.	DESCRIBE DECIDE	NATURE STUDY	DEVELOPMENT ORIGIN	PLANTS	
p.74	TDS	3	P.T.A. SUMMARIZES	OBSERVE, DECIDE REVIEW	NATURE STUDY	ORIGIN DEVELOPMENT	FRUITS	

OF AU ★	AU	DESCRIPTOR OF AU	PRESENTATION OF AU	EXPECTED BY AU	SCIENCE GIVEN BY AU	AU	AU	
INTRO. HOW-64 1-7- p.62	TGO	3	EXHIBIT	OBSERVE DESCRIBE	CLASSIFYING THINGS NATURE STUDY	CLASSIFICATION ORIGIN	SEEDS	
p.62	Dc 3, 7	3	DESCRIBES	CONSIDER	FACTS	ORIGIN	SEEDS	
EC1) p.62	TGO	3	EXHIBIT DESCRIBES	INVESTIGATE	MCO	ORIGIN	SEEDS	
EC2) p.62	TGO	3	LISTS PVE	MEMORIZE	Sp L	DEVELOPMENT	SEEDS, PLANTS	
EC3) p.62	TGO	3	EXHIBIT	CONSIDER	G Th N St.	DEVELOPMENT	SEEDS	
EC4) p.62	TGO	3	EXHIBIT	MAKE COLLECTION	CTE	FUNCTION	SEEDS	
p.63	TGO	3	ASK QUESTIONS LEAD DISCUSSION	REVIEW RECALLS AKNS	CTE NATURE STUDY	ORIGIN PROCESS	SEEDS	
p.63	A, Q, Dc 7	3	GIVES DIRECT. ASKS QUEST.	INVESTIGATE	VERIFYING Things	Development	SEEDS	
EC1) p.63	TGO	3	GIVES DIRECT.	INVESTIGATE	MCO	DEVELOPMENT	SEEDS	
EC2) p.63	TGO	3	GIVES DIRECTIONS	INVESTIGATE	MCO	DEVELOPMENT	SEEDS	
EC3) p.63	TGO	3	LEADS FIELD TRIP	Make Collection Observe	N Study STRUCTURE	STRUCTURE	PLANTS	
EC4) p.63	TGO	3	LISTS PVE	MEMORIZE	Sp L	PROCESS	SEEDS	
INTRO) p.64	TGO	3	EXHIBITS LISTS A Q	OBSERVE CONSIDER	CYE	STRUCTURE	V. PLANTS	
64 p.65	Dc 4, Q 2	3	ASKS QUEST.	COMPREHEND	G Th	DEVELOPMENT	PLANTS	
EC1) p.65	TGO	3	EXHIBITS LD	COLLECT RECOGNIZE	CTE	STRUCTURE	V. PLANTS	
EC2) p.65	TGO	3	LISTS PVE	MEMORIZE	Sp L	DEVELOPMENT	V. PLANTS	
EC3) p.65	TGO	3	DESCRIBES EXHIBITS	CONSTRUCTS MODEL	G Th	DEVELOPMENT	PLANTS	
INTRO., p.66	TGO	3	GIVES DIRECTIONS LD A Q	OBSERVES RECOGNIZE RECALL	Gr Th.	STRUCTURE DEVELOPMENT	V. PLANTS	
[illegible] I p. 66-67	TG Dc 6, Q 2	3	ASKS QUESTIONS DESCRIBES	COMPREHEND	Gr Th.	DEVELOPMENT	PLANTS	
EC1) p.67	TGO	3	EXHIBITS	OBSERVE	Gr Th.	STRUCTURE DEVELOPMENT	PLANTS	
EC2) p.67	TGO	3	GIVES DIRECTIONS	AKNS	Gr Th.	DEVELOPMENT	PLANTS	
EC3) p.67	TGO	3	EXHIBIT E[illegible]	OBSERVE RECOGNIZE	Gr Th	DEVELOPMENT	PLANTS	

OF AU	AU	OF AU	OF AU	AU	GIVEN BY AU			
* (HBU) '66 - 1								
Ec 4) p.67	TGD	3	EXHIBIT	OBSERVE	U Th Gr Th	DEVELOPMENT	PLANTS	
Ec 5) p.67	TGD	3	EXHIBIT	OBSERVE	Gr Th	Development	PLANTS	
Ec 6) p.67	TGD	3	LISD PVE	MEMORIZE	SpL	STRUCTURE	PLANTS	
INTRO. p.65	TGD	3	EXHIBIT AQ. GIVES DIRECT.	OBSERVE WONDER CONSIDER	MC O	STRUCTURE	FUNGI PLANTS	
[illegible] p.68	Dc 4, Q	3	A.Q. DESCRIBES	CONSIDER DECIDE	Gr Th	Development	FUNGI PLANTS	
Ec 1) p.68	TGD	3	LISTS PVE	MEMORIZE	SpL	—	FUNGI PLANTS	
Ec 2) p.68	TGD	3	GIVES DIRECTION	COLLECT ORGANIZE	Gr Th	DEVELOPMENT	FUNGI PLANTS	
(INTRO) p.69	TGD	3	ASKS QUEST. GIVES DIRECT. SUCCESS	OBSERVE CONSIDER	MCG	STRUCTURE	PLANTS	
p.69	Dc 3, Q	3	ASKS QUEST. DESCRIBES	CONSIDER RECOGNIZE	MCO	CLASSIFICATION	PLANTS	
p.70	Dc 2, Q	3	GIVES [illegible] DIRECTIONS	OBSERVE DISC., DECIDE	MCD	ORIGIN	GRASS PLANTS	
Ec 1) p.70	TGD	3	GIVES DIREC. Lead D.Sc.	OBSERVE WONDER	Growing Things	DISTRIBUTION DEVELOPMENT	GRASS PLANTS	
Ec 2) p.70	TGD	3	PVE	MEMORIZE	Sp L.		SEEDS	
(Ec 3) p.70	TGD	3	EXHIBIT	OBSERVE	CTE	COMPOSITION	SEEDS	
(INTRO) p.71	TGD	3	A. Q. L. D	OBSERVE RECALL - CONSAT	MC O	EXISTENCE	SEEDS	
p.71	Dc 4, Q	3	ASKS QUEST. DESC	RECOGNIZE	Gr Things	DEVELOPMENT	SEEDS	
Ec 1) p.71	TGD	3	EXHIBIT EXPLAIN	COMPREHEND OBSERVE	Gr Th	DEVELOPMENT	SEEDS	
Ec 2) p.71	TGD	3	LISTS PVE	MEMORIZE	SpL	—	SEEDS	
(INTRO) p.72	TGD	3	LEADS A.Q. FIELD TRIP	TuFT	MCO NATURE Study	DISTRIBUTION	PLANTS	
[illegible] p.72	Dc 2, Q	3	ASK QUEST DESCRIBES	OBSERVE COMPREHEND WONDER		DISTRIBUTION	PLANTS	
Ec 1 p.72	TGD	3	EXHIBIT DESCRIBES A. Q.	OBSERVE WONDER CONSIDER	MCD	STRUCTURE	PLANTS	
Ec 2 p.72	TGD	3	LISTS PVE	MEMORIZE	Sp L	—	PLANTS	
(INTRO) p.73	TGD	3	A.Q. EXHIBIT., DES	OBSERVE CONSIDER	MCD	STRUCTURE	VEGETABLE PLANTS	

OF AU	AU	DESCRIPTOR OF AU	PRESENTATION OF AU	EXPECTED BY AU	SCIENCE GIVEN BY AU	AU		
★ HBU '66								
p. 73	Dc 4, Q	3	ASK QUESTIONS LEADS DISCUSSION	OBSERVE CONSIDER	MCO	DEVELOPMENT	VEGETABLE PLANTS	
(Ec 1) p. 73	TGO	3	EXHIBIT LEAD DISCUSSION	OBSERVE EXPLAIN	MCO	DEVELOPMENT	VEGETABLE PLANTS	
(Ec 2) p. 73	TGO	3	LISTS PVE	MEMORIZE	Sp. Lang.	-	VEGETABLE PLANT	
p. 74	TGO	3	LEAD DISCUSSION ASK QUESTIONS	EXPLAIN	GROWING THINGS	DEVELOPMENT	VEGETABLE PLANTS	
p. 74	Dc 5, T	3	DESCRIBES	RECALL DIS. CLASSIFY DRIL.	CLASSIFYING Th.	STRUCTURE	FRUIT PLANTS	

dverbial Descriptors

numerical scale from 1 to 5 is used where the numbers represent terms
n the following lists.

	[illegible] 1	Adc 1 ★		Adc 1 ▣	HR 5	SB 5	[illegible] Soj-1 Ch 4	[illegible]-1 Ch 4 ★	HGw-1 Ch 7 ▣	HGw-1 Ch 7 ★
. Impressively Outstandingly Strikingly Skillfully Cleverly										
2. Clearly Completely Effectively Sufficiently Interestingly Appropriately		1		1		1	1			
3. Adequately Suitably Satisfactorily	36	28	19	23	24	27	37		51	49
4. Routinely Commonly Unclearly Incompletely Ineffectively Insufficiently Inappropriately		1	7	1	5	1				
5. Erroneously Poorly Weakly Stereotypedly Boringly										

↑ REEVALUATED (TOGETHER)

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Methods of Presentation	HBW 1	ABC 1 ★		ABC 1 ◘	HR 5	SB 5	SB-1 Ch 4 ◘	SB-1 Ch 4 ★	HBW-1 Ch. 7 ◘	HBW-1 Ch. 7 ★
Asks Question(s)		10	11	8	10	2	9		20	17
Compares										
Defines						3			1	
Describes		7	5	4	8	2	6		2	8
Explains			3	3	3		1		1	
Gives Directions	25	12	10	9	5	16	6		15	
~~Illustrates~~						1				
Lists									10	9
Mentions		1	1	2	3	2	5		1	
Presents Historical Background										
Presents Information for Analysis	6	1	1	1		2			7	
Presents Model										
Presents Theory										
Presents Vocabulary Exercise	5				1	1			8	9
Suggests		4	2	3	10	2				
Summarizes		1	1		1				1	
Tells Story										
Uses Analogy										
Exhibit or Demonstrate			5				15		21	16
Lead Discussion							9		6	8
Lead Field Trip			1				5		2	2

↑
REEVALUATION
DONE TOGETHER

tudent Task Expected by the Assignable Unit	HOW 1	ABC 1 *		ABC 1 ✱	HR 5	SS 5	SD-1 Ch 4 ■	SD-1 Ch 4 *	HOW Ch 7 ■	HOW Ch 7 *
alculate	1	8				6				
omprehend	2	6	3	2	5	5	2		6	4
onsider	1	2	4	9	7	3	12		2	12
onstruct Chart										
Construct Graph										
Construct List					1	5				
Construct Model	2				1					
Construct Picture	3						1			
Decide	16	10	4	4	1	11	8		12	~~12~~ 3
Interview Authority		1	1	1			1			
Invent										
Investigate ("Experiment")		2	4	3	5	3			8	4
Hypothesize		1	1	1	1					
Keep a Record	5	1	1	1		1				
Look at Suggested Readings					1					
Make Collection						2	32		3	4
Memorize			1	1	1				9	9
Observe	13	9	8	7	1	2	16		22	10
Organize	1	1					1			1
Plan		1				1				
Predict		1		1						
Present Demonstration	4									
Present Report	2					2	1			
Read Reference Materials					1	1				
Recall	2	5	2	2	1	1	85		2	3
Recognize	1	4	1	1		1			3	5
Review	2				1	1	5		1	~~8~~ 1
Take a Field Trip	1	1	1	1					2	2
Wonder			1		3				3	5
APPLY KNOWLEDGE TO NEW-SITUATION			3				2		2	1
DESCRIBE							2		1	1
EXPLAIN			2							2
MEASURE			4							
~~[illegible] [illegible]~~							3			

↑ REEVALUATED TOGETHER

Image of Science Given by Assignable Unit "Science is:"

	HEW 1	ABC 1*		ABC 1#	HR 5	SC 5	SB-1 Ch4 ■	SB-1 Ch 4 *	RBW-1 Ch7 ◻	RBW-1 Ch7 *
Attacking Problems		1	2	2	16					
Classifying Things						5	1		1	2
Cooperative Human Endeavor					1					
Creative Human Endeavor					3					
Curiosity					1					
~~Describing Things~~		23	—	7		5	—		—	—
Discovering Mysterious Phenomena										
~~Explaining Things~~	15	5	—	3	4	1	—		—	—
Exploring										
Facts		7	5	3						1
Ideas					3	1				
Learning about Myself										
Making Things	5									
Messing About	1									
Nature Study							22		15	~~4~~5
Openmindedness										
Persistent Human Endeavor										
Specialized Language	7		4		1	16			16	4
Servant of Man	1		—	2		1	—		—	—
Taking Things Apart	2									
Technology	2	1				4				
Verifying Things			5	5	2	3			1	2
Working Carefully			1	3						
CONTROLLING THE ENVIRONMENT			9				9		5	5
GROUPING THINGS							6		19	15
MAKING CAREFUL OBSERVATIONS			3				7		4	13
MAKING MEASUREMENTS			5							

↑ REEVALUATION

Mode of Assignable Unit	HBW 1	ABC 1 ★		ABC 1 ■	HR 5	SB 5	SB-1 Ch 4 ■	SB-1 Ch 4 ★	HBW-1 Ch 7 ■	HBW-1 Ch 7 ★
~~Association~~ -	25	12	—	2	4	6	—		—	—
Behavior-		14	1		11		4			
Classification-	9	2	5	5		2	4			1
Composition-			1							1
Development-						1	11		33	23
Distribution -						1	10		4	3
Existence-		1					6		4	1
Interaction -			10	3						
Origin -					1	1			18	5
Process-	1		4	7	11	1	1		1	2
Structure-	1	4	3				4		6	10
Transformation-			1	1		19	1			
Function			6				4		3	1
Relationship			9				12		2	

↑ Reevaluation

M

TOPICS

ABC ★ 1	
BURNER	1
CONTROLLING FIRE	1
FIRE	9
FIRE PREVENTION	2
FUELS	4
HEAT	2
MEASURING TEMPERATURE	8
OXIDATION	7
TEMPERATURE	2

ABC ★■ 1	
FIRE	- 13
FUEL	- 3
RUSTING	- 8
TEMPERATURE	- 8
OXIDATION	- 3

ABC ■ 1	
AIR	2
CANDLE	2
FIRE	7
FIRE SAFETY	1
FLAME	2
FUELS	4
FIRE STATION	1
HEAT	1
LIGHT	1
OXIDATION	2
OXYGEN	2
RUSTING	7
TEMPERATURE	8
THERMOMETER	6

HOW-1 CH 1 ■	
FRUITS	-3
FUNGI	-7
GRASSES	-4
PLANTS	-26
PLANT PRODUCTS	-2
SEEDS	-17
TREES	-1
VEGETABLES	-2
LIGHT	-2

HOW-1 CH 1 ★	
FRUITS	-1
FUNGI	-4
GRASSES	-2
PLANTS	-22
SEEDS	-17
VEGETABLES	-5

Appendix G: Working Draft

OUTLINE OF EPIE INTERVIEW SCHEDULE FOR ELEMENTARY SCIENCE TEACHERS
INTERVIEW SCHEDULE: R 3

Not for distribution. EPIE, 1967

I. Introduction

- A. Overview
- B. Purposes
- C. Agreement

II. First judgment of science materials

- A. Identification
- B. Reaction
- C. Describing materials

III. Intentions - outcomes

- A. Aims for learners
- B. Outcomes observed by teacher
- C. Authors' aims
- D. Comparisons

IV. Conditions of use I: Antecedents

- A. Learners
- B. Classroom
- C. Teacher
- D. Administration - supervision
- E. Community

V. Conditions of use II: Transactions

- A - N Instructional organization, style

VI. Final judgment

- A. Overall
- B. Reservations
- C. Strengths

VII. Closing procedures

- A. Quotes
- B. Setting
- C. Respondent's background.

Note to interviewer: All sentences written in capital letters and in quotations are to be read aloud. As quotable comments emerge during the course of the interview, please jot down as much as possible in Section VII: Summary Procedure, or in margins when they occur.

I. INTRODUCTION

A. Overview: (Exchange pleasantries. Do not discuss EPIE or interview.)

"MISS __________________, I ASSUME WE'D AGREE THAT YOUR DECISIONS ABOUT SCIENCE MATERIALS COULD BE IMPROVED BY YOUR HAVING INFORMATION ON HOW WELL THEY WORKED FOR OTHER TEACHERS? (Pause for assent.) GOOD, NOW I WOULD LIKE TO READ A STATEMENT WHICH DESCRIBES THE PURPOSES FOR TODAY'S INTERVIEW. AFTER YOU HEAR THE STATEMENT YOU MAY HAVE SOME QUESTIONS. I'LL BE HAPPY TO ANSWER THEM.

"EPIE STANDS FOR EDUCATIONAL PRODUCTS INFORMATION EXCHANGE, A NONPROFIT AGENCY CREATED BY PROFESSIONALS FROM ALL QUARTERS OF THE EDUCATIONAL COMMUNITY. EPIE GATHERS INFORMATION ABOUT THE ACTUAL PERFORMANCE OF SCHOOL MATERIALS. RIGHT NOW, IT IS WORKING ON ELEMENTARY SCIENCE MATERIALS.

"EPIE WANTS TO ENCOURAGE INNOVATION OF NEW EDUCATIONAL MATERIALS AND IMPROVEMENT IN THE DESIGN AND USE OF EXISTING MATERIALS. EPIE WILL MAKE ITS INFORMATION AVAILABLE TO EDUCATORS LIKE YOU TO HELP SELECT WISELY AMONG THE INCREASINGLY NUMEROUS AND COMPLEX EDUCATIONAL MATERIALS BECOMING AVAILABLE. AFTER WE COMPLETE OUR INFORMATION GATHERING, YOU CAN FIND OUT IN A PUBLICATION CALLED EPIE FORUM HOW IT IS AVAILABLE TO YOU AND OTHER TEACHERS."

B. Interview Purposes

"DURING THIS INTERVIEW, I WILL BE ASKING YOU A VARIETY OF QUESTIONS ABOUT YOUR EXPERIENCES USING SCIENCE MATERIALS FOR CLASSROOM INSTRUCTION. EPIE DOES NOT KNOW IF THE QUESTIONS IT ASKS ARE ALL THE RIGHT ONES OR IF THEY ARE ALL NECESSARY. I HOPE YOU WILL BE TOLERANT IF A FEW QUESTIONS SEEM OF LITTLE VALUE TO YOU. IF WE ERR IN OUR QUESTIONING, WE HOPE IT IS IN THE DIRECTION OF OVER-DESCRIBING THE INFORMATION YOU HAVE ABOUT SCIENCE MATERIALS."

C. Agreement

"NOW, YOUR SPECIFIC ANSWERS TO THESE QUESTIONS WILL BE SHARED WITH NO ONE OUTSIDE EPIE WITHOUT YOUR CONSENT. WE ARE RETAINING YOUR NAME TO PUT THIS INFORMATION TOGETHER WITH INFORMATION YOU MAY GIVE US IN THE FUTURE. THE INTERVIEW USUALLY TAKES 40 MINUTES. IF YOU DON'T UNDERSTAND A QUESTION, PLEASE LET ME KNOW."

II. FIRST PROBE FOR JUDGMENT OF SCIENCE MATERIALS:

A. Product Identification:

"WHAT TEXTBOOK AND OTHER INSTRUCTIONAL MATERIALS ARE YOU USING IN YOUR SCIENCE TEACHING THIS YEAR?" (If teacher mentions using two or more texts for science instruction, say) "WHICH OF THESE DO YOU CONSIDER YOUR PRIMARY TEXT? THEN LET'S TALK ABOUT THAT ONE

________________________________."

____

Name of text and series

____

Other materials

____

____

B. First Judgmental Reaction:

1. "PLEASE GIVE ME A GENERAL REACTION TO (name of textbook)." (Whatever teacher says should be followed by your saying,) "TELL ME MORE ABOUT______________________" (the principal theme of the teacher's general reaction. Interviewer follows the leads of the teacher without any attempt to guide, nor to explore areas not mentioned by the teacher. Use the back of facing page to note the teacher's general reaction.)

2. "WHAT IS THE STRONGEST FEATURE OF THE TEXT?" (Check any that are mentioned. Do not read the list or suggest.)

   a. ☐ student affect: challenge, enthusiasm, interest, motivation

   b. ☐ aid to teacher: demonstrations, tests, teaching tips

   c. ☐ problems, projects, experiments for students

   d. ☐ physical features: durability, size, print

   e. ☐ diagrams, graphs, charts, maps, pictures

   f. ☐ readability, clear, common sense approach

   g. ☐ science content covered, ordering of topics

   h. ☐ ________________________________
   other

   i. ☐ ________________________________

3. "WHAT IS THE GREATEST FAULT?"
(Check each as mentioned. Do not read the list or suggest. If any of the first three * items are mentioned, then you ask the teacher:)

"WHAT DO YOU DO TO STRENGTHEN THIS ASPECT OF THE TEXT?"

* a. ☐ needs more help for teacher:
tests, evaluation procedures, demonstrations

Remedy: ______________________________

____

* b. ☐ poor coverage of science content; or ordering of topics

Remedy: ______________________________

____

* c. ☐ inadequate problems, projects, experiments for pupils

Remedy: ______________________________

____

d. ☐ student affect: challenge, enthusiasm, interest, motivation

e. ☐ physical features bothersome: durability, printsize, booksize

f. ☐ readability level inappropriate: lacks clarity

g. ☐ insufficient number or poor quality of charts, diagrams, pictures, drawings

h. ☐ ______________________________
other

4. "HAVE YOU COMPARED THIS TEXT WITH ANOTHER COMPETING TEXT RECENTLY?"

☐ no

☐ yes

____
name

(If 'yes':) "WHAT DIFFERENCES DID YOU FIND?" __________

____

5. "IF YOU HAD AN OPPORTUNITY TO SPEAK TO THE PRODUCERS OF ALL ELEMENTARY SCIENCE TEXTS AND MATERIALS, WHAT WOULD THE MAIN IDEA OF YOUR MESSAGE BE?"

☐ change ____

____

☐ add ____

____

☐ delete ____

____

☐ no message

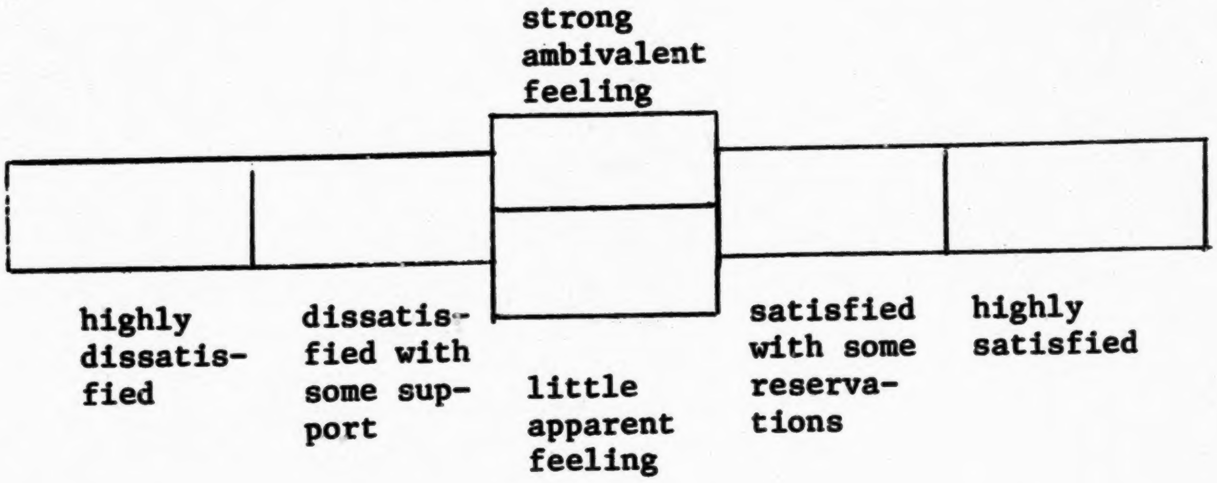
6. (Interviewer makes a judgment indicating the teacher's overall satisfaction with the text. Do not read.)

		strong ambivalent feeling		
☐	☐	☐	☐	☐
		☐		
highly dissatisfied	dissatisfied with some support	little apparent feeling	satisfied with some reservations	highly satisfied

II. C. "LET'S TURN NOW TO A FEW SPECIFIC QUESTIONS ABOUT THE MATERIALS. FIRST, THE TEXTBOOK: HOW DO YOU FIND ITS READABILITY?" (Read the list.)

			Mixed Feelings	No Opinion		
1. **TEXTBOOK**						
a. READABILITY	Easy	☐	☐	☐	☐	Difficult
b. CHOICE OF SCIENCE CONTENT: TOPICS	Appropriate	☐	☐	☐	☐	Inappropriate
c. ORDER OF CONTENT	Appropriate	☐	☐	☐	☐	Inappropriate
d. DURABILITY	Wears well	☐	☐	☐	☐	Wears out
e. ILLUSTRATIONS	Good	☐	☐	☐	☐	Poor
2. **EXERCISES & PROBLEMS, TEXT OR WORKBOOK**						
a. CHOICE	Relevant	☐	☐	☐	☐	Not relevant
b. DIFFICULTY LEVEL	Appropriate	☐	☐	☐	☐	Inappropriate
3. **GUIDE TO TEACHER, TEACHER'S EDITION (including preface and supplementary materials)**						
a. PHILOSOPHY, STATEMENT OF GOALS	Well Stated	☐	☐	☐	☐	Not apparent
b. SUGGESTIONS FOR ACTIVITIES	Helpful	☐	☐	☐	☐	Not helpful
c. EVALUATION SUGGESTIONS AND TESTS	Useful	☐	☐	☐	☐	Not useful
d. ADDITIONAL READINGS, FILMS & FILMSTRIPS	Useful	☐	☐	☐	☐	Not useful

4. Ask the teacher, "CONSIDERING EVERTHING WE HAVE DISCUSSED TO THIS POINT, WHAT IS YOUR OVERALL JUDGMENT OF THE QUALITY OF THE MATERIALS?"


strong ambivalent feeling
highly dissatisfied
dissatisfied with some support
little apparent feeling
satisfied with some reservations
highly satisfied

III. QUESTIONS ON INTENTIONS

A. (Repeat the following stem for each of the 5 aims.) "HOW MUCH EMPHASIS DO YOU PLACE ON HAVING YOUR STUDENTS:"

	Teacher doesn't know (A)	No emphasis (B)	Minor emphasis (C)	Average emphasis (D)	Great emphasis (E)
1. LEARN WHAT THE MAJOR BRANCHES OF SCIENCE ARE (BOTANY, PHYSICS, SOCIAL SCIENCE,...)?	☐	☐	☐	☐	☐
2. UNDERSTAND HOW SCIENTIFIC RESEARCH HELPS EXPLAIN THE PROBLEMS OF DAILY LIVING?	☐	☐	☐	☐	☐
3. ACQUIRE A GENERAL APPRECIATION FOR ALL FORMS OF SCIENCE?	☐	☐	☐	☐	☐
4. THINK AND ACT INDEPENDENTLY USING SCIENTIFIC METHODS OF INQUIRY?	☐	☐	☐	☐	☐
5. LEARN WHAT IS NECESSARY FOR LATER SCIENCE COURSEWORK?	☐	☐	☐	☐	☐

B. "NOW LET'S CONSIDER YOUR EMPHASIS AGAIN. DO YOU FEEL THE AIMS YOU HAVE JUST IDENTIFIED ARE BEING ACHIEVED IN YOUR SCIENCE INSTRUCTION?" (Read only those aims which the teacher said received average or great emphasis in III A.)

	yes	no	undecided
Emphasis 1	☐	☐	☐
2	☐	☐	☐
3	☐	☐	☐
4	☐	☐	☐
5	☐	☐	☐

C. "AUTHORS, OF COURSE, HAVE OBJECTIVES TOO. LET'S GO THROUGH THESE AIMS AGAIN FOR STILL ANOTHER REASON: TO RECORD WHAT YOU SEE YOUR TEXTBOOK'S AUTHOR'S GOALS TO BE. THINK BACK TO WHAT IT SAYS IN THE GUIDE, OR PREFACE, AND WHAT IS EMPHASIZED IN THE TEXT. (Pause.) NOW, HOW MUCH EMPHASIS DO THE AUTHORS PLACE ON HAVING YOUR STUDENTS:

	Teacher doesn't know (A)	No emphasis (B)	Minor emphasis (C)	Average emphasis (D)	Great emphasis (E)
1. LEARN WHAT THE MAJOR BRANCHES OF SCIENCE ARE (BOTANY, PHYSICS, SOCIAL SCIENCE,...)?	☐	☐	☐	☐	☐
2. UNDERSTAND HOW SCIENTIFIC RESEARCH HELPS EXPLAIN THE PROBLEMS OF DAILY LIVING?	☐	☐	☐	☐	☐
3. ACQUIRE A GENERAL APPRECIATION FOR ALL FORMS OF SCIENCE?	☐	☐	☐	☐	☐
4. THINK AND ACT INDEPENDENTLY USING SCIENTIFIC METHODS OF INQUIRY?	☐	☐	☐	☐	☐
5. LEARN WHAT IS NECESSARY FOR LATER SCIENCE COURSEWORK?	☐	☐	☐	☐	☐

D. "DO YOU FEEL THERE ARE DIFFERENT AIMS TO BE FOUND BETWEEN THE MATERIALS OF DIFFERENT PUBLISHERS ... OR ARE THEY PRETTY MUCH ALL THE SAME?"

☐ no opinion ☐ the same ☐ differences exist

(If the teacher feels there are differences, ask:) "PLEASE TELL ME THE PUBLISHER AND SERIES' NAME AND THE DIFFERENCES IN THEIR AIMS."

	Author's Aim(s)	Emphasis Given
1. ______________________ Series or publisher	________ ________ ________	________ ________ ________
2. ______________________	________ ________ ________	________ ________ ________

(Note to interviewer: use the numbers 1-5 (see C above) as a code for the author's aim, and the letters A-E (see C above, also) as a code for the emphasis given.)

IV. SPECIFICATIONS FOR ANTECEDENTS

A. Learners

1. "WHAT IS THE AVERAGE AGE OF YOUR PUPILS?" ____________.

2. "NOW THINK ONLY OF CHILDREN OF AGE ________. CONSIDER THEIR INTELLIGENCE. WOULD YOU SAY THAT THESE MATERIALS (name of materials) ARE APPROPRIATE FOR ALL LEVELS OF I.Q.?"

"FOR LOW?"	"FOR MIDDLE?"	"FOR HIGH?"
☐ yes	☐ yes	☐ yes
☐ no	☐ no	☐ no
☐ dnk (do not know)	☐ dnk	☐ dnk

3. (Use for Grades 2 - 8 only)
"ARE THESE MATERIALS APPROPRIATE FOR STUDENTS WHO READ

ONE YEAR BELOW GRADE LEVEL?"	☐ yes	☐ no	☐ dnk
TWO YEARS BELOW GRADE LEVEL?"	☐ yes	☐ no	☐ dnk
THREE YEARS BELOW GRADE LEVEL	☐ yes	☐ no	☐ dnk

4. "ARE THESE MATERIALS EQUALLY APPROPRIATE FOR BOYS AND GIRLS?"

☐ more for Boys ☐ equal ☐ more for Girls ☐ dnk

5. "ARE THESE MATERIALS FOR PUPILS

OF HIGH MOTIVATION?"	☐ yes	☐ no	☐ dnk
OF LOW MOTIVATION?"	☐ yes	☐ no	☐ dnk

6. "DO YOUR PUPILS GENERALLY LIKE THESE MATERIALS?"

☐ yes ☐ no ☐ mixed ☐ dnk

B. Classroom

1. "CAN YOU THINK OF ANY SPECIAL EQUIPMENT THAT YOU HAVE TO HAVE BECAUSE YOU ARE USING (these materials) THAT YOU WOULDN'T HAVE TO HAVE USING OTHER SCIENCE MATERIALS?"

☐ yes "WHAT ARE THEY?" ____________________
☐ no ____________________
____

2. "CAN YOU THINK OF ANY CLASSROOM ARRANGEMENTS THAT YOU HAVE TO HAVE BECAUSE YOU ARE USING THESE MATERIALS THAT YOU WOULDN'T HAVE TO HAVE USING OTHER SCIENCE MATERIALS?"

☐ yes "WHAT ARE THEY?" ____________________
☐ no ____________________
____

3. "CAN YOU THINK OF ANY ADMINISTRATIVE CLEARANCE THAT YOU HAVE TO HAVE BECAUSE YOU ARE USING THESE MATERIALS THAT YOU WOULDN'T HAVE TO HAVE IF YOU WERE USING OTHER SCIENCE MATERIALS?"

☐ yes "WHAT CLEARANCE?" ____________________
☐ no ____________________
____

C. Teacher

1. "CONCENTRATE ONCE AGAIN ON YOURSELF IN THE CLASSROOM DURING YOUR SCIENCE TEACHING. DO YOU SEE YOURSELF AS MORE ON THE PRACTICAL SIDE OR AS MORE ON THE IDEALISTIC SIDE?" (Pause, now choose one of the following to read, based on the teacher's reply.)

(If "practical", read:)
"WOULD YOU SAY YOUR TEACHING IS DOWN-TO-EARTH, TOWARD PRACTICAL, USEFUL THINGS RATHER THAN IDEALISTIC, TOWARD ABSTRACT, LONG RANGE VALUES?"

(If "idealistic", read:)
"WOULD YOU SAY YOUR TEACHING EMPHASIZES THE IMPORTANT LONG RANGE HUMAN VALUES RATHER THAN PRACTICAL, DOWN-TO-EARTH, DAY-TO-DAY PROBLEMS?"

(If "undecided", read:)
"DO YOU FEEL THAT YOUR TEACHING IS ABOUT EQUALLY CONCERNED WITH IMPORTANT, LONG RANGE HUMAN VALUES AND PRACTICAL, DOWN-TO-EARTH, DAY-TO-DAY PROBLEMS?"

Practical	Practical But	Undecided	Idealistic But	Idealistic
☐	☐	☐	☐	☐

2. "HERE IS ANOTHER DIFFICULT CHOICE FOR MANY TEACHERS: DO YOU CONSIDER YOURSELF MORE ON THE FLEXIBLE SIDE OR MORE ON THE ORDERLY SIDE? THAT IS, DO YOU LIKE - MORE OR LESS - TO LET THE THINGS THAT HAPPEN MAKE THE SCHEDULE, OR DO YOU LIKE TO HAVE A FIRM SCHECULE AND SEE THAT THINGS HAPPEN ACCORDINGLY?"

(If "flexible", read:)
"WOULD YOU SAY THAT YOU ARE MORE FLEXIBLE THAN - SAY - A VAST MAJORITY OF THE TEACHERS YOU KNOW?"

(If "orderly", read:)
"WOULD YOU SAY THAT YOU ARE MORE ORDERLY, BETTER ORGANIZED THAN - SAY - A VAST MAJORITY OF THE TEACHERS YOU KNOW?"

(If "undecided", read:)
"DO YOU FEEL THAT YOU ARE PRETTY MUCH THE SAME AS OTHER TEACHERS AS FAR AS BEING FLEXIBLE AND ORDERLY IN THE CLASSROOM?"

Flexible	Flexible But	Undecided	Orderly But	Orderly
☐	☐	☐	☐	☐

3. "NOW, WOULD YOU SAY THAT YOU ARE RELATIVELY HAPPY OR RELATIVELY DISSATISFIED WITH THE TEACHING JOB THAT YOU HAVE? JUST HOW DO YOU FEEL?"

Quite pleased	Rather satisfied	So-So	Somewhat dissatisfied	Quite dissatisfied
☐	☐	☐	☐	☐

4. "YOU HAVE GIVEN US SOME INSIGHT INTO HOW YOU FEEL ABOUT YOUR WORK. HOW DOES YOUR PRINCIPAL VIEW YOU?" (Do not read or suggest.)

Positive			Negative	
Strong	Somewhat		Somewhat	Strong
☐	☐	(Support)	☐	☐
☐	☐	(Personal feeling)	☐	☐

5. "WILL YOU BE TEACHING HERE OR ARE YOU CHANGING POSITIONS NEXT YEAR?"

☐ yes ☐ no ☐ undecided

(If "no" ask:) "WOULD YOU CARE TO TELL ME WHY YOU ARE CHANGING YOUR POSITION?"

- ☐ to take a position in this same school more appropriate to training
- ☐ circumstances dictate it: school closing, getting married, pregnant, etc.
- ☐ seeking better teaching assignment
- ☐ other
- ☐ no comment

D. Administration

1. "WOULD YOU DESCRIBE YOUR PRINCIPAL MORE AS AN ADMINISTRATION SPECIALIST OR AS A CURRICULUM COORDINATOR?"

☐ administration specialist
☐ curriculum coordinator
☐ neither, both, do not know, profanity

2. "DO YOU HAVE AN ELEMENTARY SCIENCE COORDINATOR?"

☐ yes ☐ no ☐ dnk

3.

(If yes) "HOW FREQUENTLY DO YOU AND THE SCIENCE COORDINATOR DISCUSS SCIENCE INSTRUCTION?"	(If no) "HOW FREQUENTLY DO YOU AND THE PRINCIPAL DISCUSS SCIENCE INSTRUCTION?"

☐ Almost every day
☐ 2 - 3 times per week
☐ 2 - 3 times per month
☐ sometimes, but less than once a month
☐ almost never

4. "TO WHOM WOULD YOU 'WRITE' IF YOU WANTED TO MAKE A STRONG PETITION AGAINST ANY POOR INSTRUCTIONAL MATERIALS YOU WERE EXPECTED TO USE?"

☐ supervisor
☐ principal
☐ superintendent
☐ school board
☐ public figure outside school
☐ other ______________________
☐ I would not make such a petition

(Interviewer may substitute "call" or "speak" for "write.")

5. "WHO SELECTED YOUR TEXT FOR YOUR CLASSROOM USE?"

☐ curriculum committee
☐ science supervisor or his staff
☐ principal or superintendent
☐ teacher
☐ teachers in the building
☐ other

6. "IS THIS TEXT ADOPTED SYSTEM-WIDE?"

☐ yes

☐ ______________________________
other

E. Community

"DESCRIBE THE NEIGHBORHOOD(S) YOUR SCHOOL SERVES:

a. "SOCIO-ECONOMIC STATUS"

☐ Disadvantaged
☐ Middle Class
☐ Highly privileged
☐ Mixed - high contrast

b. "PARENTS' INVOLVEMENT IN SCHOOL AFFAIRS"

☐ Disinterested
☐ Average
☐ High Involvement

c. "GENERAL PUBLIC'S ATTITUDE TOWARD TEACHING OF SCIENCE"

☐ Like any other subject
☐ Slightly more interested in science
☐ Considered to be very important

V. TRANSACTIONAL CONDITIONS OF USE

A. "HOW LONG IS A TYPICAL SCIENCE CLASS PERIOD?"

☐ 15 min. ☐ 30 min. ☐ 45 min. ☐ hour + ☐ other ______________

B. "HOW MANY OF THOSE PERIODS DO YOU HAVE PER WEEK?"

☐ less than one ☐ 1 ☐ 2 ☐ 3-4 ☐ other ______________

C. "HOW MANY PUPILS DO YOU TEACH SCIENCE TO EACH WEEK?"

☐ 1 class ☐ combined classes (team) ☐ several classes ☐ other ______________

D. "THEN YOU TEACH THE SAME ____(C)____ PUPILS IN SCIENCE FOR ABOUT ____(A x B)____ MINUTES PER WEEK?"

E. "IN A TYPICAL SCIENCE PERIOD OF ____(A)____ MINUTES, HOW MUCH TIME IS SPENT STUDYING THE TEXT (AND/OR WORKBOOK)?" (You may call it study time, reading assignment or something like that.)

F. "DO YOU HAVE STUDENTS WORK ON INDIVIDUAL SCIENCE PROJECTS OR LABORATORY EXERCISES DURING THE YEAR?"

☐ yes ☐ no ☐ on occasion

G. "DO ALL PUPILS GET ABOUT THE SAME ASSIGNMENTS?"

☐ yes ☐ most with a few exceptions ☐ individualized

H. "HOW ARE THE PROJECTS SELECTED?

1. ☐ "COMPLETELY BY EACH PUPIL?

2. ☐ "INDIVIDUALLY FROM THE TEACHER'S LIST?

3. ☐ "ASSIGNED TO EACH PUPIL BY THE TEACHER?"

I. "ABOUT WHAT PERCENT OF THE TOTAL CLASS TIME DURING THE YEAR IS SPENT IN INDIVIDUAL AND GROUP PROJECTS?"

☐ 0 % ☐ 25 % ☐ 50 % ☐ 75 % ☐ 100 %

J. "CONSIDERING NOW THE REMAINING TIME -- THAT IS, NOT STUDY TIME NOR PROJECT TIME -- TIME THAT WE MIGHT CALL CLASS TIME. DO YOU USUALLY GROUP THE CHILDREN FOR CLASS WORK OR DO YOU WORK WITH THE CLASS AS A WHOLE?"

☐ subgroups ☐ whole class

K. "SOME TEACHERS SPEND CLASS TIME LECTURING, DEMONSTRATING HOW THINGS WORK, HOLDING RECITATION, HOLDING DISCUSSIONS, GIVING QUIZZES.

1. "HOW IS MOST OF YOUR CLASS TIME SPENT?

a ☐ LECTURING

b ☐ DEMONSTRATING HOW THINGS WORK

c ☐ RECITATION

d ☐ DISCUSSION

e ☐ LABORATORY

f ☐ QUIZZES

g ☐ INDIVIDUAL PROJECTS

h ☐ ____________________
other

2. "WHICH OF THESE DO YOU SPEND NEGLIGIBLE OR NO TIME ON AT ALL?

a ☐ LECTURING

b ☐ DEMONSTRATING HOW THINGS WORK

c ☐ RECITATION

d ☐ DISCUSSION

e ☐ LABORATORY

f ☐ QUIZZES

g ☐ INDIVIDUAL PROJECTS

h ☐ ____________________
other

3. "DO YOU SPEND HALF-TIME ON ____________________
(select the one mentioned in # 1)

☐ yes ☐ ____________________
(other)

4. "DO YOU SPEND ABOUT AS MUCH TIEM ON ____________________
(select another from # 1)

AS YOU DO ON ____________________?"
(the one named first)

(Keep cutting the instructional pie by comparing each of the areas in # 1 with the most, next-most time consuming class activities. Do this by following the format in question # 1 to arrive at the estimated percents below. Do not read aloud to teacher.)

	% time spent		% time spent
lecturing	______	laboratory	______
demonstration	______	quizzes	______
recitation	______	individual projects	______
discussion	______	____________ other	______
			100 % Total

L. "HOW CLOSELY DO YOUR CLASSTIME ACTIVITIES FOLLOW THE TOPICS IN THE TEXTBOOK? (AND/OR WORKBOOK)?"

☐ Very closely ☐ Somewhat closely ☐ Not at all

M. "WHICH OF THESE WOULD BEST DESCRIBE THE PUPILS IN YOUR SCIENCE CLASS?"

☐ HARD WORKING AND ENTHUSIASTIC ______________________________
remarks

☐ HARD WORKING AND WELL DISCIPLINED ______________________________

☐ BELLIGERENT AND UNRULY ______________________________

N. "HAVE YOU CHANGED YOUR TEACHING STYLE OR TECHNIQUE SINCE YOU STARTED USING THESE PARTICULAR MATERIALS?"

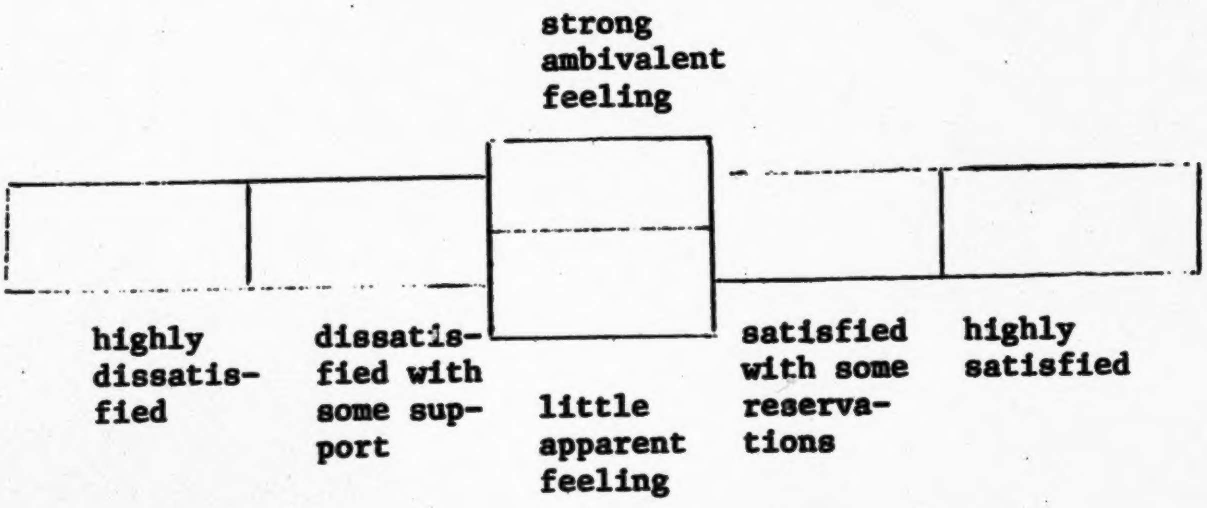
☐ yes ☐ no "IN WHAT WAY?" ______________________________
____

(If "yes") "WAS THE CHANGE MADE LARGELY BECAUSE OF THE REQUIREMENTS OF THESE MATERIALS?"

☐ yes ☐ no

VI. FINAL PROBE FOR JUDGMENTS:

A. "CONSIDERING OUR TOTAL DISCUSSION TODAY AND ADDING ANYTHING I HAVE FAILED TO MENTION, HOW GOOD ARE THESE MATERIALS, ALL IN ALL?"


strong ambivalent feeling
highly dissatisfied
dissatisfied with some support
little apparent feeling
satisfied with some reservations
highly satisfied

B. 1. "OK, NOW FOR THE LAST TIME, PLEASE SUMMARIZE YOUR GENERAL RESERVATIONS ABOUT THE MATERIALS."

2. "PLEASE SUMMARIZE AGAIN THE STRENGTHS OF THE MATERIALS AS YOU SEE THEM."

VII. SUMMARY PROCEDURE:

A. Quotable comments: (Phrases used by the teacher during the course of the interview which seem particularly revealing of his judgment of the products' performance, strengths, weaknesses.)

1.

2.

B. **Interview Setting:**

1. Date ______________________

2. Teacher ______________________

3. Place ______________________

4. Interviewer ______________________

5. Where ______________________

6. Time (length) ______________________

7. Unusual events during interview: ______________________

____

____

8. Problems related to interpersonal dimension as it developed in interview. So you have any reason to feel that the data from this interview should be held suspect?

☐ no ☐ yes

(If "yes" indicate part(s) of interview concerned; why.)

____

____

____

____

____

VII. C. EPIE INTERVIEW: INFORMATION SHEET

Interviewer ____________________ Month, Day, Year ____________

I. Background Data:

Last name ____________ First ____________ School ____________ Grade ______

Teaching responsibility ____________________ Years taught ______

Years with materials ____________ Highest degree ____________ Date conferred ______ Major Field ______

Who selected materials for use? ____________ How long (yrs.) in use now? ____________ How long will they be in use? ______

II. Summary Reaction:

	Poor or worse	With Reservations	Ambivalent	Positive reaction in gen.	Good or better
Judgment of product	☐	☐	☐	☐	☐
Judgment of self as teacher of product	☐	☐	☐	☐	☐
Prognosis for future of product in your class	☐	☐	☐	☐	☐
Your assessment of whether this interview accurately portrays your judgments	☐	☐	☐	☐	☐

III. Your interviewer may have noted (verbatim) your comment on the materials. May we please quote these comments? You may read them first, of course.

☐ yes ☐ ____________________ other

Appendix H: Draft Manuscript

The Anatomy of a Prototype Institute to Train Information Research Associates

by

Robert T. Filep

James Boswell has written that knowledge is of two kinds: we know a subject ourselves, or we know where we can find information about it. Chances are that when you identify a colleague as a source of information and inquire about his use of an educational product, you probably will receive either one of two kinds of answer. First, there is the type of statement that is brief yet loaded with emotional connotations; and second, there is the other type, so lengthy and diffuse that you learn more about the product than you care to know.

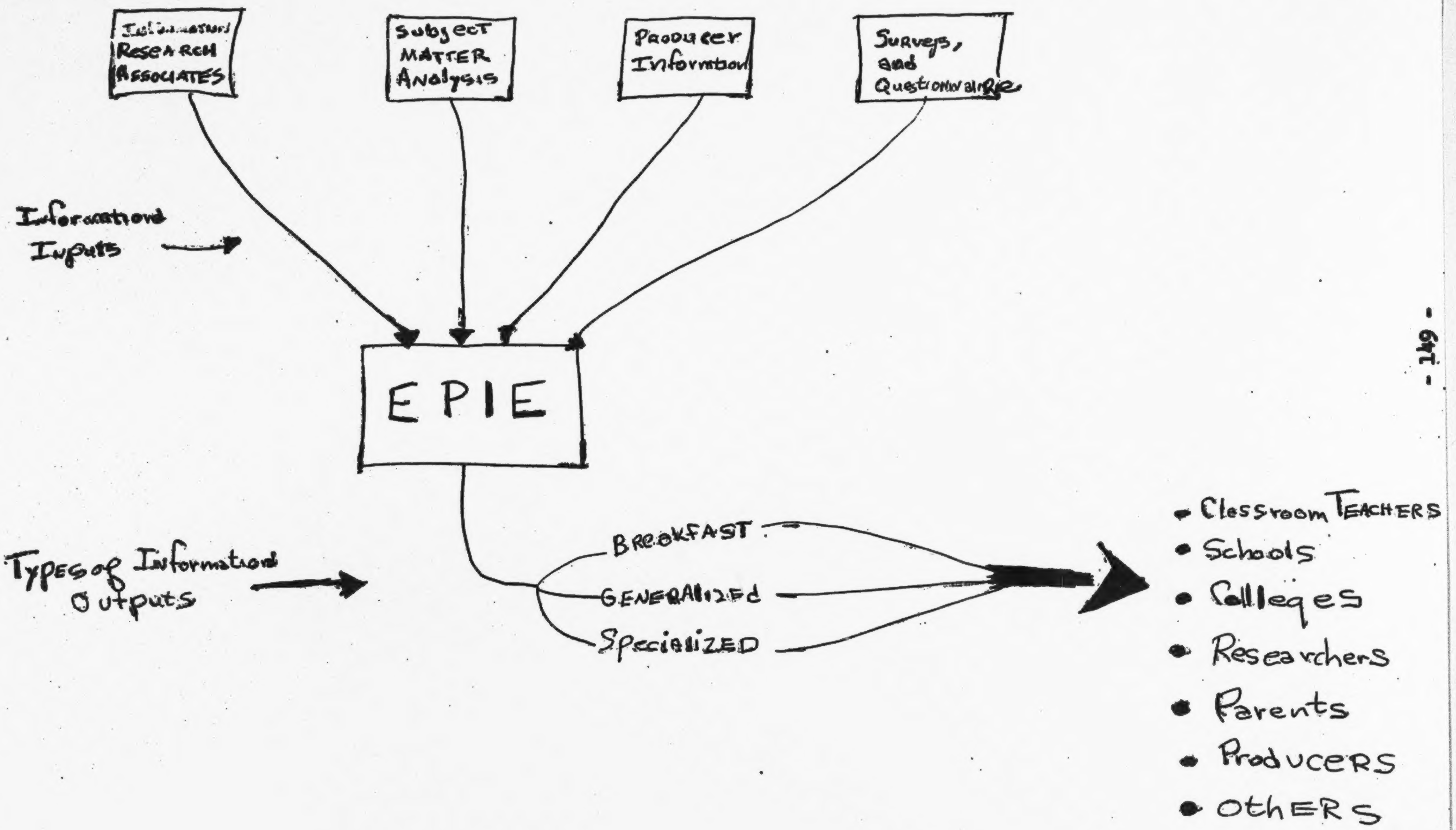
Consider then the complexity of gathering information from many such users, reporting this information in a reliable fashion, and synthesizing the data for dissemination to any potential user who inquires of a central source for such information. The EPIE (Educational Products Information Exchange) Institute held at Southampton College of Long Island University from August 13-31, 1967, dealt with aspects of just this problem.

The prime objective of this exploration and learning effort was to test a prototype training package which could be used for training many professionals in the strategy and technique of collecting educational product information. Upon completion of the Institute and following field experience, these trained professionals would then be designated as EPIE Information Research Associates. Their future responsibilities would be to collect data for EPIE from educational product users by means of a "standardized" interview protocol.

Dr. Filep is an Education Systems Scientist at System Development Corporation (SDC), Santa Monica, California and a member of the graduate faculty in Education, UCLA. The Institute described in this article was designed by Dr. Filep under contract by EPIE with SDC.

Figure 1.

A Possible EPIE Information Flow


[illegible] Research Associates
Subject Matter Analysis
Producer Information
Surveys, and Questionnaire
Information Inputs
EPIE
Types of Information Outputs
Breakfast
Generalized
Specialized
• Classroom Teachers
• Schools
• Colleges
• Researchers
• Parents
• Producers
• Others

The need for Information Research Associates in any product information exchange becomes clear when one considers a construct which shows how product information might be obtained by EPIE (see Figure 1). Initially, there will be a need for direct product user contact in collecting information. Having a sampler of opinions of products in the field, the IRA provides a full opportunity for supplementing major questions required by the EPIE protocol. Ambiguities can be cleared up and the background of important material explored at first hand. Interpretations can be checked and the data enriched by using the responses to develop further questioning. If carried far enough, the interviewee may even be able to contribute to the formulation of new questions that could possibly elicit the relevant information in a more satisfactory way. This, of course, requires that the IRA give the product user a reasonably complete account of the purposes and problems of the product survey. Consequently, an important ingredient of training must be imparting to the IRA the theoretical and operational construct of EPIE objectives. Indeed, the IRA can increase the value of his feedback in direct correlation to his understanding of the total operation of the information exchange and the underlying rationale for the methods and procedures used by EPIE.

The development of a system for creating Information Research Associates was an interesting challenge. Certainly it had to be viewed in both the theoretical and operational dimensions as a type of continuing education for professionals. For all the participant-professionals involved, rusty skills would have to be polished, new skills and outlooks gained, and relevant links to current job assignments identified.

The participants attending the prototype Institute included representatives from three states: New York, New Jersey, and Pennsylvania. The career positions these educators held were: State Title I Evaluation Coordinators, County Child Study Supervisors, Area Curriculum Coordinators, College Curriculum Center Researchers, and Regional Educational Center Representatives. These people were responsible for action programs in their respective agencies as well as being decision makers at various levels of authority. They were students only in the sense that new ideas and techniques were to be learned. They brought to the Institute a day-in, day-out "action-doing" orientation, a wide range of prior experiences and knowledge, and a self concept of being professionals who were identified as "knowing" the answers. They expected that the experiences provided by the program would be relevant to whatever prior concept they had of an IRA, and simultaneously would be partially applicable to their current positions.

The Institute's faculty was composed of university and research organization personnel currently involved with education and information problems. Since the task of identifying the skills and behaviors required for the Information Research Associate was totally new and unique, any course of study had to cut across a number of established disciplines. Consequently, it was necessary to involve related but dissimilar disciplines in order that the strengths and relevancies of each could be fused in the attempt to develop the sacred and profane facets of this new professional designation, the IRA.

The faculty represented a multi-discipline background including curriculum evaluation research, interview protocol techniques development, tests and measurement development, information sciences, and computer sciences. All faculty members were actively involved in classroom teaching prior to the Institute.

In addition, guest faculty from several parts of the country were invited to meet with the group. In each instance, these personnel were currently involved in some aspect of product information collection, synthesis, and analysis at the local, state, or national level. (A list of participants and faculty is provided at the end of the article.)

By design, the individual's role in the prototype institute is not designated in the list of participants. During the three-week period the continuing Zeitgeist essentially was to be a forum for the exchange of ideas and the application of an iterative approach. The attempt was to assure feedback to faculty at every stage of the learning program. Consequently, two-way communication in the spirit of dialogue between all concerned was the goal, as contrasted to a lecture/notetaking effort.

The general objectives for the prototype Institute were to:

1. Establish a forum whereby participants and faculty could enter into a dialogue directed toward enriching and refining the theoretical, mathematical, and operational languages involved in product information collection and exchange.

2. Provide a developmental field trial of a training program designed to prepare Information Research Associates.

3. Acquaint participants with the objectives and purposes of the Educational Products Information Exchange and those of the EPIE Information Research Associate (IRA).

4. Familiarize the participants, currently involved in education, with the approaches and methodologies to be used by EPIE in collecting and disseminating information about the use of educational products.

5. Train the participants in aspects of educational psychology, educational technology, and educational measurement relevant to EPIE, the IRA, and their professional assignments.

6. Give initial experiences and guidance in the use of a developmental interview protocol which would be utilized (by the Institute participants functioning as IRAs) during a field trial of the instrument in the fall of 1967.

7. Develop an awareness on the part of the participants regarding the problems that they might face when performing as IRAs interviewing classroom teachers, and identify methods for coping with these problems.

8. Provide opportunities for participants to evaluate the place of judgment in educational research design and reporting.

9. Enable Institute participants to evaluate and suggest revisions of EPIE techniques and procedures for training IRAs.

It should be clear that the preceding objectives of the Institute dealt with conceptual constructs as well as specific techniques. In carrying out the objectives of the Institute, a number of teaching techniques and media were utilized. These included: small group discussions, video-taping laboratories, audiovisual programed instruction, tutorial sessions, simulation games, large group instruction, group dynamics sessions, and self diagnostic examinations. Some of the approaches to teaching during the conduct of the Institute are outlined below.

- Video-tape Recording and Critique Sessions. The meetings provided an opportunity for the participants to obtain practice in using interview protocols. The participants were recorded on video-tape while conducting the interviews with simulated product users. Following the taping, they were able to review their performance and discuss the strengths and weaknesses of their interview techniques with faculty members.

To observe one's self and be able to be a critic of one's behavior, given a set of criteria, seems to be a far more effective method for changing performance than having someone tell you how you performed and suggest methods for modifying your behavior. In this respect, the video-tape recorder proved to be a powerful teaching instrument.

- Critiques and Seminars on Protocol Instruments. Participants were encouraged to assist with the evolution of interview protocols, both from the standpoint of a person who would be using the instrument as well as that of a product user. Formal critiques and seminars were devoted to this topic and revisions of the protocol instruments were made based upon student comments prior to any further student use of the instruments in a simulated interview session.

- Simulation Games. A game of this nature was used to provide the participants with a series of "experiences" in information transfer. The game is designed to model any situation in which one group is responsible for improving the performance of another group by providing them with information. This game, developed by Fred L. Goodman, was described in the initial issue of the EPIE FORUM. The information exchanged in the game concerns a simple game of logic which is played by those who assume the role of information system "users." Several teams of counselors compete and cooperate in an effort to improve the performance of those actually playing the game. A rather wide array of problems are imbedded in the situations, including those caused by too little redundancy in the message exchanged as well as those which occur from failure to see the need for "team" play in exchanging information.

- Programed Sequences. These instructional units were presented via synchronized filmstrip and audio tape. Self-scoring pre- and post-tests were provided and the sequences required active responding on the part of the students. These materials were developed by Vimcet Associates of Los Angeles, California and helped provide a conceptual framework for the IRA of the context in which an educational product might be developed, field tested, and revised, as well as techniques for conducting these activities.

- Self Diagnostic Examinations. All examinations were presented in a fashion which enabled the students to conduct a self-analysis of how well they had reached the objectives for each week. Formal discussions were held to discuss and critique the test instruments and to enable students to clarify key points.

- Individual Conferences. In order to accommodate the wide range of backgrounds and interests of the participants, the faculty members were readily available throughout for individual discussions. These meetings centered upon the work in the Institute but also provided an opportunity for participants to draw upon identified interests and capabilities of faculty members in solving aspects of problems related to their current job assignments.

- Group Dynamics Sessions. Group Dynamics was explored in the opening series of meetings. This technique was attempted in order to rapidly integrate the group and to provide an opportunity for the participants to release any aggressive feelings or any hostilities which, even though they were indirectly related to the Institute, might impede the desired outcomes of the educational experience. The major objective for the three meetings was to coalesce the group rapidly into a working unit in order to focus them upon the training work at hand.

- Traditional Approaches. The assumption that individuals learn in many different ways and from many forms of media provided the rationale for including some time-proven approaches to teaching, including: lectures, discussion groups, individual study sessions, and films. A synthesized typical week of activities in the Institute is provided in Figure 2.

The "typical" week of activity provides some idea of the variety of instructional configurations and approaches that were utilized during the Institute. Imbedded in the context of each of the three weeks was a group of teaching objectives that were designed to help reach the overall Institute objectives outlined earlier. Some of these objectives are provided below in order to aid the reader in obtaining a clearer insight into the range of behaviors that the faculty felt were worthy of exploration in this developmental version of the Institute.

First Week

At the end of the first week the students were able to:

1. Identify and discuss the conceptual construct of EPIE.
2. Compare and contrast general measurement techniques.
3. Describe the processes involved in systematic instructional decision making.
4. Critique an initial draft of an interview protocol and suggest areas for revision.
5. Evaluate a "live" data collection interview and provide constructive criticism for improvement of the sampler's techniques.
6. Describe introductory constructs in educational measurement: scale, standard scores, assessment of achievement vs. change.
7. Utilize interview protocols at a beginner's level through repeated practice sessions.
8. Relate the role of the IRA to the overall operation of EPIE.
9. Distinguish correctly between written objectives representing the cognitive, affective, and psychomotor domains of pupil behavior.
10. Define and discuss the terms reliability, content validity, construct validity, control of error, and absolute scores.
11. Achieve scores on an attitude measure which reflect a positive attitude toward objectives which are both behavioral and important.
12. Analyze the processes and/or products of the key stages in the development of validated instructional materials.
13. Describe a rationale (Stake's) for evaluating education products and programs.
14. Identify five different observational instruments.
15. Outline the key issues in subjective and objective evaluation procedures.

XERO COPY XERO COPY XERO COPY XERO COPY

Second Week

At the end of the second week the students were able to:

1. Specify the method of scaling paired comparisons.
2. Analyze correctly and solve a paired comparisons problem.
3. Contrast the evaluation perspectives of the experimentalist, the counselor, and the accreditation agency.
4. Identify the ten categories of the Flanders observational system.
5. Apply the above system in a preliminary fashion to a video-tape simulation and a film of classrooms in progress and evaluate the interactions observed.
6. Relate scaling methods to EPIE requirements for the quantification of complex objects.
7. Conduct interviews and participate in self-evaluation by viewing video-tape recordings of each interview.
8. Identify pertinent research studies relating to interviewing and observational methodology.
9. Describe the documentary evidence that might accompany a validated instructional product.
10. Compare and contrast behaviors for each level of the cognitive and affective domains.
11. Identify important techniques for conducting interviews.
12. Identify and construct student and class performance objectives using both quantitative and qualitative standards.
13. Compare and contrast the methods for collecting product information in the field of educational technology.
14. Describe the methods whereby the overhead projector will be treated as a "class" in the EPIE system.

Third Week

At the end of the third week the students were able to:

1. Describe the concept of contingency in relation to the EPIE research plan and in terms of correlational methodology.
2. Improve in the use of the EPIE interview protocol through additional practice in use and by viewing video-tapes of themselves conducting interviews.
3. Identify classifications in sociometry and perform entry level tasks in applying sociometric techniques.
4. Compare and contrast nominal, ordinal, interval, and ratio scales.
5. Analyze five unobtrusive measures and their relationship to experimental design and EPIE.
6. Distinguish between equivalent practice, analogous practice, and prerequisite tasks for pupil activities and write learning activities for each category.
7. Write "perceived-purpose-activities" to include exhortation, deduction, induction, and extrinsic reward.
8. Identify the major categories and products currently [illegible] for computer-assisted learning and how EPIE might treat these as a product class.
9. Describe a set of variables that might be required by any user of the EPIE system.
10. Identify ways in which EPIE might utilize a computer time-sharing system.
11. Synthesize the major research efforts, techniques, and approaches to information sampling.
12. Analyze and revise the objectives for the three week institute.

The preceding objectives were attained by most participants during the three weeks. The faculty members were well aware that a variety of performance levels would be present because of the wide range of entry behaviors and the nature of the objectives. However, the need to explore many objectives was important in order to test the initial conceptual construct of what comprised potential IRA behaviors. The feedback provided by the students and the continuing review of the instruction helped, of course, to identify certain objectives that would be more valuable than others in creating the final training for an IRA.

At the culmination of the second and third weeks of instruction, lengthy oral and written critiques of the Institute were requested from the participants. This activity provided the participants with a formal opportunity to direct their critical appraisal capabilities to specific instructional events and sequences of such events. The faculty group undertook a similar effort. Assessment of the ratings by both the participants and the faculty indicated that this initial Institute was considered successful in meeting its overall objectives. However, a clear specification was made of numerous activities that should be repeated or deleted from any future training effort.

A few of the general categories for continuing review are:

- A resolve that as a clear identification evolved of how the IRA might operate most successfully in the field, this knowledge would be incorporated in the training procedures.

- Directly related to the preceding concern was one which raised the question of how well the role of an IRA could be filled by an individual at less than a professional level. Perhaps, following the field test of protocols and procedures by professionals, other less highly trained personnel could effectively undertake the data collection tasks. This concern is a two-fold problem: How well can even professionals function as IRAs when they may be restricted in terms of time and job objectives by their career assignemtns; and, is it efficient to utilize highly qualified professionals in this role on a full time basis, once the methods and procedures are identified? A possible solution might be to have the professional manage a group of less qualified opinion samplers in his particular geographic area.

- Possibly there could be an even greater use of the video tape recorder in aiding IRAs to develop their interview techniques, and also an increase in the use of active responding instructional sequences in the training.

- Perhaps shorter and more intensive training which might require less time away from professional assignments.

- Consideration of increased opportunities for self-diagnosis in dealing with Institute objectives, based upon the rationale that professionals are reluctant to expose their lack of ability to other practicing professionals.

During the fall months the Institute participants will obtain producer user data utilizing a version of the interview protocol which they helped to revise. They will conduct at least three interviews with self-contained classroom teachers who are using elementary school science materials. Hopefully, they will be able to interview teachers at various grade levels. Following these activities a two-day follow up session which will involve the participants and the Institute faculty members will be held in November.

The final Institute critiques proved valuable and further analyses are being made to ascertain what the participants thought they needed and what the faculty felt was vital to carrying out the EPIE-IRA mission. The final analysis of what knowledge was of most worth, will have to be deferred until the assessment of the fall field trials has been made. The vital field behaviors will have to be correlated with the initial theoretical construct and the synthesis of the three-week effort. The prototype Institute did indeed provide considerable insight regarding what knowledge, behaviors, and techniques are of most worth in the training of an Information Research Associate.

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Figure 2 - A SCHEDULE FOR A TYPICAL WEEK

	MONDAY	TUESDAY	WEDNESDAY	
8:00	Interview Techniques and Interview Schedules (Lecture-Discussion)	Observational Methodology (Laboratory)	Establishing Performance Standards (Self-Instruction-Discussion)	EPI
9:45	Interview Laboratory (Use of Protocols)	"What Does the User Need From EPIE" (Lecture-Discussion)	Critique of Interview Protocols (Seminar)	EPI
12:00	Lunch	Lunch	Lunch	Lu
1:00	Stating Educational Objectives-Taxonomies (Self-Instruction, Discussion)	Unobtrusive Measures (Lecture-Discussion)	"200,000 Bits of Information" (Lecture)	In
2:[illegible]	Instructional Analysis, Checklists, Rating Scales (Lecture-Discussion)	Individual Study	Observational Methodology Applied to a Classroom (Laboratory)	
4:00	Film Fare	Recreation	Film Fare	Fi
7:00	Informal Discussions	Video taping of Interviews and Critiques	Informal Discussions	Co

A TYPICAL WEEK

SDAY	THURSDAY	FRIDAY
Performance uction-)	EPIE Game (Simulation Laboratory)	Self-Test - Critique and Discussion
nterview	EPIE Game (Discussion)	Sociometrics (Lecture-Discussion)
	Lunch	Lunch
of "	Interview, Taping Critiques (Laboratory)	Strategies for Content Analysis (Seminar)
Methodology a Classroom)		Individual-Faculty Appointments
	Film Fare	Recreation
cussions	Concert - Lecture	

Appendix I: Working Document

Sampling Design for the Four-State Cooperative Project

Delimitation of the Universe

The universe for the study is defined to include:

All public elementary schools with formal programs in science instruction during the 1968 school year in the states of New York, Pennsylvania, New Jersey, and Delaware.

A number of the concepts in the statement of delimitation need explanation.

Public elementary schools are here defined as including all those operated by and directly financed with state funds. The most prevalent form of grouping by grades, about 75%, is expected to be the 1-6 (or K-6) arrangement. In less than 15% of the schools will grades 1-8 and 1-12 arrangements be found. In a very few other elementary schools, we will find grades 1-3 constituting an elementary school unit. The decision to exclude non-public schools derived from the source of initial support for EPIE, the U.S. Office of Education, and from anticipated funding from state departments of education.

Elementary school science was selected as a result of a questionnaire survey conducted by the Institute for Educational Development for EPIE, utilizing a national sample identified by the American Association of School Administrators. Elementary school science was shown to be a curriculum area of very great concern to the school systems.

A formal program in elementary school science is thought to be an important sample prerequisite. Only those elementary units which formally intend to teach science are likely to purchase materials explicitly for achieving some intended instructional goal in science. Further, those presumably few instances where science is not taught formally in the elementary school would probably be sufficiently unusual to make it difficult to produce warranted generalizations from study data collected therein.

The four-state universe results from the leadership taken by the heads of their respective state departments of education. (As explained earlier in this document, a Title V proposal submitted to the U.S. Office of Education for the funding of the Four-State Project proposal was never considered since its receipt in Washington coincided with Congressional amendment of the Title V of ESEA.) Though funding through Title V was not possible, the cooperation of the states remains and makes it prudent for our restriction of the universe to these four states.

EPIE considers that these restrictions exclude less than ten percent of the hypothetically complete universe. Since the Department of Education census statistics for the 1968 school year will not be available until 1969, a more precise estimate will have to wait until the requisite confirming data become available.

The Sample

A three-stage sampling scheme will be followed in the selection of schools. The first stage involves the selection of a ten-percent sample of the elementary school districts defined as eligible for the purposes of this study.

Clustering by school district is being employed in preference to a single-stage sample of students or a two-stage sample wherein students would be sub-sampled from each of the eligible elementary schools. One reason for this decision is the necessity of employing field research agents at each of the schools from which students and teachers will be included, in order to insure accuracy of the subsampling process within the school and to insure a high rate of inventory and/or interview completions. For this reason EPIE thinks it desirable to select relatively large numbers of cases from each of the districts falling into the sample. It is realized of course, that fewer districts and schools in the sample will increase the ease of gathering data -- but will correspondingly increase the sampling variance of estimates pertaining to the entire universe. However, the sampling unit will be sufficiently large as to help reduce the error, and, balancing the pressure toward a small number of sampling units against the pressure toward minimizing errors of estimate, EPIE feels a first-stage ten-percent sample to be close to optimal.

A number of arbitrary decisions will undoubtedly be involved in the formation of primary sampling units. It will be difficult to determine whether schools which deviate from the sample's descriptors should be included in the secondary sample. It is hoped that these will run at less than five percent and therefore not markedly bias the results.

Each eligible district will be allocated to one of ten strata on the basis of an index reflecting size, and financial and urban-rural characteristics. Values with respect to each of these three variables will then be calculated for each of the school districts and will be used to rank each eligible district independently. The three strata will be defined as:

I. Upper ten percent in average teacher salary and per-pupil expenditure

II. Middle thirty-four percent in average teacher salary and per-pupil expenditure

III. Lower ten percent in average teacher salary and per-pupil expenditure

Within each of these three strata the districts will then be assigned to three groups on the basis of their location -- urban, suburban, or rural. Within each of the resulting nine substrata the districts will be ordered with respect to a measure of size, and the districts will be sampled systematically with equal probability proportional to the measure of size. In the case of several strata it will very likely be necessary to sample with equal probability a substratum composed of the smallest districts in order to avoid intricate weighting adjustments at the tabulation stage of the field studies.

The measure of size will be the number of students enrolled in the district in 1967-8 as shown on state department of education records. Wherever possible, these same records will be used to determine the pupil expenditure and average teacher salary figures.*

The number of schools selected from a given stratum will be arbitrary. The numbers will be arrived at by trying to balance the needs of the anticipated district-by-district analyses against the need to avoid a ponderous system of weights.

As was mentioned, differential sampling rates within strata will be necessary because one of the chief objectives of the study is to estimate the parameters pertaining to the product performance of elementary science curriculum materials in a wide range of instructional settings. To assure a sufficiently stable data base where the sample design delimitations may severely restrict the population parameters, a disproportionately larger sample will of necessity result within these strata.

For any given school system the subsampling rate for schools (and within the school the subsampling rate for students) will be the ratio of the overall sampling rate for the school system's stratum to the school system's probability of being selected. It is believed this procedure will compensate for any disproportionality between the measure of size which is assigned to a system (or a school) at the primary stage of selection and the actual number of students found to be eligible for inclusion in the field study. It is anticipated that the assigned measures of size will be imperfectly related to the actual size because systems, schools, and student bodies will vary considerably as to the amount of change which will have occurred between collection of state department basic data and the start of the study.

A Final Word on Sample Estimates To make sample estimates two types of weighting are thought to be necessary. The questionnaire returns, completed interviews, and test results furnished by systems and schools within systems with probabilities less than the sampling rate for their strata will have to be weighted so as to bring the probability of such a school, or such a system, up to the stratum level. These are most likely to occur in three of the nine substrata, as shown in the table on the next page:

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*In those instances where the figures are not available from the state department of education the school districts will be queried directly for these data.

PRIMARY STRATA

SECONDARY STRATA	I Upper 10% Teacher Salary & Pupil Expenditure	II Middle 34% Teacher Salary & Pupil Expenditure	III Lower 10% Teacher Salary & Pupil Expenditure
URBAN	✓		
SUBURBAN			✓
RURAL	✓		

Many of the schools in those strata will be sampled at a lower rate which will be compensated for by weighting their returns to bring their probability up to the probability of the overall sampling rate of their respective strata. This is quite speculative judgment at this writing but it constitutes a reasonable guess.

Since the parameters of many schools and individual respondents within them who will fail to return questionnaires or choose not to participate in the study will be unknown, it will not be possible to make a precise estimate of the full population parameters. It may be possible only to report the departures in normality from the design as they are observed, make compensatory adjustments as feasible, and accordingly employ more conservative generalizations from the findings.

Field Research Associates

A field research associate will be assigned to each of the districts. His first task will be to collect the previously cited data from the state departments of education or the local school districts. This information will be necessary for the establishment of an overall sample rate for the field study. The next task of the field associate will be to assemble a list of the schools who meet the criteria for eligibility detailed earlier in this section. The Institute's senior staff will then identify a random ten-percent sample of target schools.

The cooperation of the officials at each of these schools will then be sought by the field representative to confirm the school's eligibility and its willingness to participate in the field study.

In-depth Study

At sixty of the schools in the sample (twenty each in New York and Pennsylvania, fifteen in New Jersey, and five in Delaware), all pupils and teachers will be included when the probability of the school's being included is either less than or equal to the student sampling rate set for the school strata. These schools will serve as complete coverage schools wherein all instruments and techniques to be employed throughout the survey will be administered.

Appendix J: From The EPIE Forum, September, 1967

a research rationale for epie

Robert E. Stake

Over 95% of all research in education concentrates on individual differences among *students*. Without contesting the importance of those differences, EPIE has adopted a rationale for research concentrated upon differences among *products*. In many ways, product research is similar to student research, but there are important differences between the two. Some of these similarities and differences, along with the outline of a general research plan, will be spelled out in this article.

As explained elsewhere in this issue of *The EPIE Forum*, EPIE will examine instructional products of many kinds. Some products will fall within the so-called "hardware" category: projectors, CAI-computers, tape recorders, and so forth. Some products will be the so-called "software" variety: textbooks, teacher's guides, films, encyclopedias. Some day, a few of the "products" viewed by EPIE may be more technique than product: team teaching, flexible scheduling, BSCS biology. A research rationale for EPIE has had to be drawn generally enough to permit the description and judgment of a large variety of materials and techniques.

It might be easier for all concerned if all important usage information and instructional products were free of personal judgment—easier, but less useful. The physical specifications and cost of these products can be documented objectively, but not their ease-of-use nor their developers' philosophical orientation. EPIE's researchers will have no choice but to deal with subjective judgments. Their research design, however, will be one which attempts to deal with subjective judgments in an objective, standardized, and forthright way.

Every product can, of course, be described in a variety of ways, and comparisons among products can be made on many different grounds. Two dictionaries, for example, may differ as to number of words defined, size of type, durability of binding, and attractiveness of illustrations. They may differ, too, in less tangible matters, such as the thoroughness of definitions or the sanctity in which formal grammar is held. One dictionary is likely to be better for some purposes, another for other purposes. It will be the responsibility of the researcher to describe the dictionaries as fully as he can, then to indicate the conditions under which he knows or suspects that individual dictionaries will do a good job (and, sometimes, which dictionary will do a better job).

But what is a good job? People have different ideas of what a product should do—just ask them. One teacher wants a social studies textbook to emphasize human dignity. Another wants it to emphasize the increasing cosmopolitanism of our people. One administrator wants a book inoffensive to each of the neighborhoods in his pluralistic school district. One wants it to shy away from topics that will hasten its obsolescence. One parent will only believe in the book if it acknowledges that his minority group is subjected to deprivation and humiliation. Another parent wants the book to cover all the social science a youth needs to gain admittance to college. Consciously and unconsciously, people have different expectations of the products they use.

The EPIE research rationale has no stronger commitment than the commitment to record and to honor this diversity of values. No product evaluation can be complete without a survey of the preferences and priorities of the many groups of people who use the product, or who may benefit or be injured by it.

But this commitment does not preclude forthright statements of relative values. A moment ago, I indicated that one dictionary—to mention one kind of product—may be better for one use, another for another use. It is *possible* that some products will be ideally suited (or, at least, better suited than any competing product) for all conceivable uses. But it is unlikely. Frequently, a user will recommend a product for use with only certain children, for only certain courses, for only certain teachers, for only certain times, for only certain educational objectives. Occasionally, an educator will spot inconsistencies in the way an author develops a lesson or in the way a director organizes a film-strip. Occasionally, a teacher will spot a substantial bonus of "implicit learnings" in a routine workbook exercise. Such flaws and bonuses will be more important in one classroom than another. Product information from EPIE should reveal both the "target" uses and the "out-of-bounds" uses of the product—as seen by the producers and the users of the product.

Let me summarize what I have said so far about EPIE's research rationale. EPIE will describe products available for use in the classroom. Included in the descriptions will be information about user satisfaction and dissatisfaction. Many different product dimensions and conditions-of-use will be considered. Merit will not be presumed to lie on a single unidimensional scale of value, but will be attached to the features and functions that are important to different users. The value of an educational tool is complex. EPIE will never engage in simple, universal comparisons.

research rationale

THE USEFULNESS OF PRODUCT INFORMATION

No one doubts that educators need to exchange information among themselves about instructional tools and techniques. Yet there is apprehension among educators (and certainly among producers) about organized efforts to obtain that information—and with good reason. The hazards of prejudice are no less than the hazards of ignorance.

It is obvious to the supporters of EPIE that the need for information justifies the risk of prejudice, i.e., the possibility of encouraging an occasional unwarranted innovation or maintaining some out-dated standards. The risk can be kept small; but the need for information cannot be made small, for it grows out of the imperative need for rational decision-making. If educators want to offer high quality programs they must know the merits of alternative materials available to them. EPIE's research aim is to provide the curriculum organizer and the instructor with information that facilitates their planning and increases their professional competence.

Educators are not alone in their need for knowledge about what works in the classroom. The lay public, too, has such a need. Though it is unreasonable to expect either the man on the street or the community leader to understand the technical characteristics of curricular materials, it is essential for the wellbeing of every school system that community members have access to background information against which to scrutinize major curriculum decisions. Much product evaluation information should reach the community directly from teachers and school administrators, but additional reliable information should be available as well. Some of it already is. More is needed. In many communities, EPIE publications will rightfully become at least occasional reading for school board members, PTA committees, interested parents, and newspaper editors.

Quite apart from the need for facts upon which rational decisions can be based is the need for a general skepticism about results. The proof of the pudding is in the eating; the proof of the teaching is in the learning. Too often, books, machines, teaching aids, and tools are bought because of their physical attractiveness, the prestige of their producer, or the intrinsic quality of their components; too seldom are they bought on the basis of results—the results of a step-by-step study by potential users or of a standardized inspection by disinterested parties. EPIE intends to be a disinterested informer, describing in detail facts that have been revealed in laboratory and classroom testing, and emphasizing the satisfaction, dissatisfaction and conditional-acceptance of users from community to community. And in producing these facts EPIE hopes to whet our appetites for more facts, and to bolster professional skepticism about results.

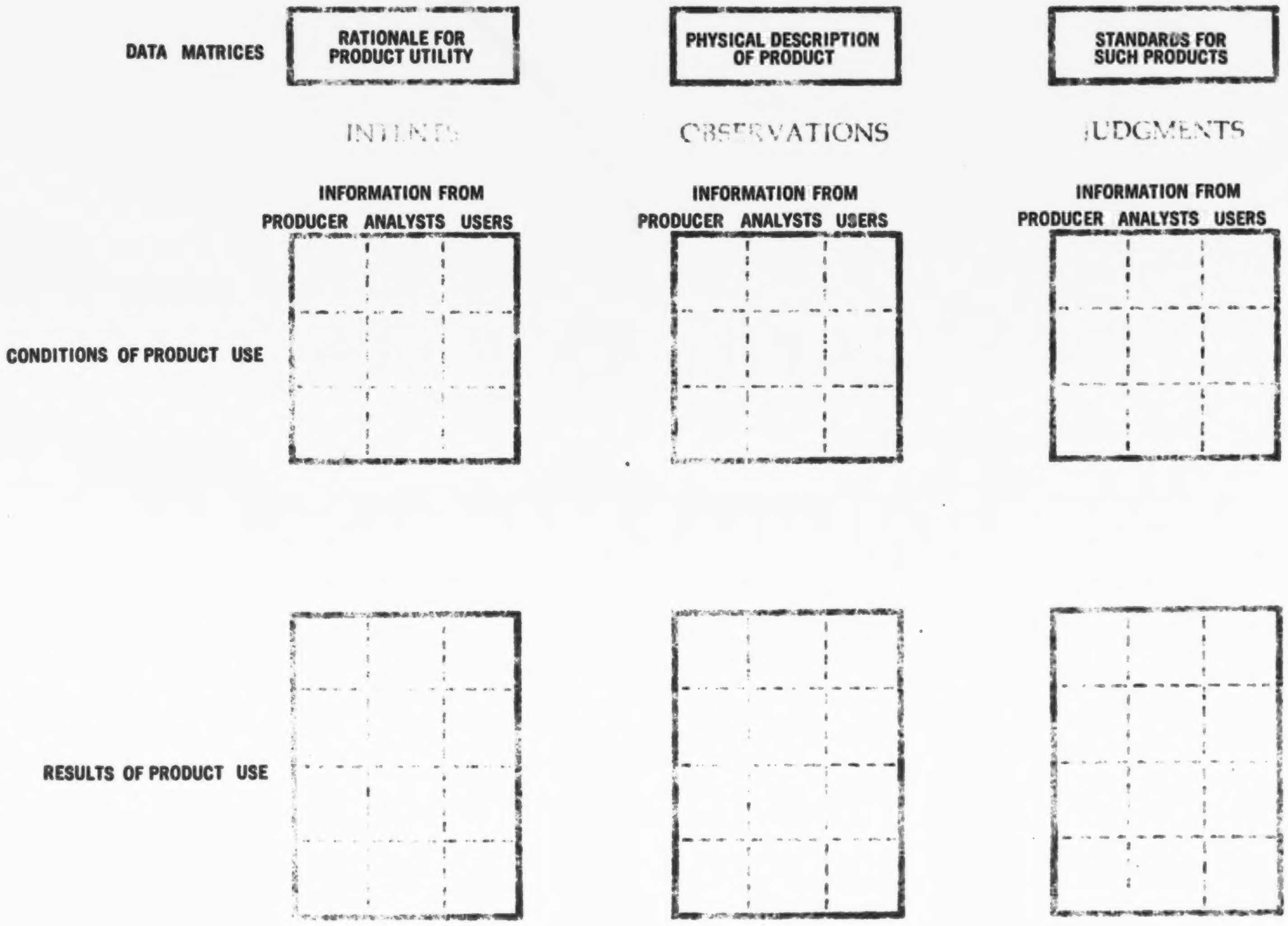
It is reasonable to suppose that EPIE's influence on instructional equipment and materials will tend not only toward better quality but also toward greater diversity. New products can be expected when it is better understood that one arithmetic series does not serve all children well, that one model of overhead projector does not fit all teaching needs, and that one kind of video tape does not perform best under all conditions-of-use. From East to West, from downtown to suburb, the conditions of education are not uniform—and in a pluralistic society, with heterogeneous children, they should not be. Producers of educational products should design special-purpose materials whenever they—and researchers and teachers—identify needs for such materials. Because reports from EPIE will attempt to identify the limits of general use and the potential for special uses, these reports should contribute to the diversification of educational tools.

YPES OF PRODUCT INFORMATION

hat does a teacher need to know about a product? The swer will vary from product to product, but one fact is rtain: a teacher needs to know lots of different things. To e adequately informed he needs to know the physical prop- rties of the product, the purposes for which it was in- nded, the conditions under which it has been used, the tual results of its use, and the judgments of users and ob- rvers. Since each of these types of information may in- olve dozens of variables and hundreds of observations of rformance, some device is needed to organize data in a sable form. The device EPIE has chosen to use—and, in a nse, the embodiment of its research rationale—is the mat- x illustrated in Figure 1. The cells of this matrix are the pigeon holes" of EPIE's desk, the mail boxes in its post ffice—spaces for the storage of information and reminders f all the different types of communication that will be en- ountered.

For a complete up-to-date description of a product, a large amount of information will continually be entered and stored in each of the nine major cells, each of the 63 subcells indicated by dashed lines, and each of many sub-subcells (not shown). To cope with this deluge of information EPIE plans to classify some data as Intents, some as Observations, and some as Judgments. Actually, EPIE will solicit most of the data, and the matrix will also serve to guide the development of questionnaires, tests, observation schedules, content analysis check lists, criteria for entering new information and for extracting outdated information, and other evaluation instruments.

To begin with, EPIE will describe a product in terms of its own rationale (as explicated by its developer or implied by its "content" and "recommended uses") and in terms of its formal specifications, physical properties, and market information. The product should also be seen against a background of standards accepted by school people for products


DATA MATRICES
RATIONALE FOR PRODUCT UTILITY
PHYSICAL DESCRIPTION OF PRODUCT
STANDARDS FOR SUCH PRODUCTS
INTENTS
OBSERVATIONS
JUDGMENTS
INFORMATION FROM
PRODUCER ANALYSTS USERS
INFORMATION FROM
PRODUCER ANALYSTS USERS
INFORMATION FROM
PRODUCER ANALYSTS USERS
CONDITIONS OF PRODUCT USE
RESULTS OF PRODUCT USE

igure 1. Matrices to guide the collection of evaluation information about an educational product.

of its type, and it may be EPIE's job to assemble the material needed to clarify that background. Elaborated statements of these three kinds, i.e., rationale, properties, and standards, are represented by the top three cells in Figure 1.

The other six major cells in Figure 1 will be used to describe a product's *use.* Subdivisions of these cells sort out bits of usage information as to type and source. In the middle row of cells, the matrix calls for data on the Conditions of Product Use—data that will ultimately reveal the circumstances under which the product succeeds or fails. EPIE will first note how the producers, analysts, and users expect the product to be used—on what children, with what teachers, in what classrooms, for what purposes. Then, EPIE will ascertain actual conditions-of-use in a large number of schools. To round out the picture EPIE will solicit judgments as to the desirability of the various conditions under which the product is being used. Coupled with knowledge of results, the data of this middle row should permit EPIE to circulate reliable statements about the generality of a product's application, i.e., whether its results are dependent on special circumstances or can be expected just about anywhere it is used.

The cells of the bottom row call for data on Results of Product Use. EPIE's reports will emphasize, as all evaluations should, the visible *effects* of the product. Outcomes of use will be ascertained by testing students, by observing classrooms, by interviewing teachers, and by questioning supervisors—not under all conditions-of-use, of course, but with as much scope and intensity as budget (and restraint upon obtruding on instruction) will allow. As indicated in the detailed list of Table 1, EPIE clients will want to determine the student accomplishments, changes in student attitude, and effects upon the staff, the school, and the community that may be attributed to use of the product.

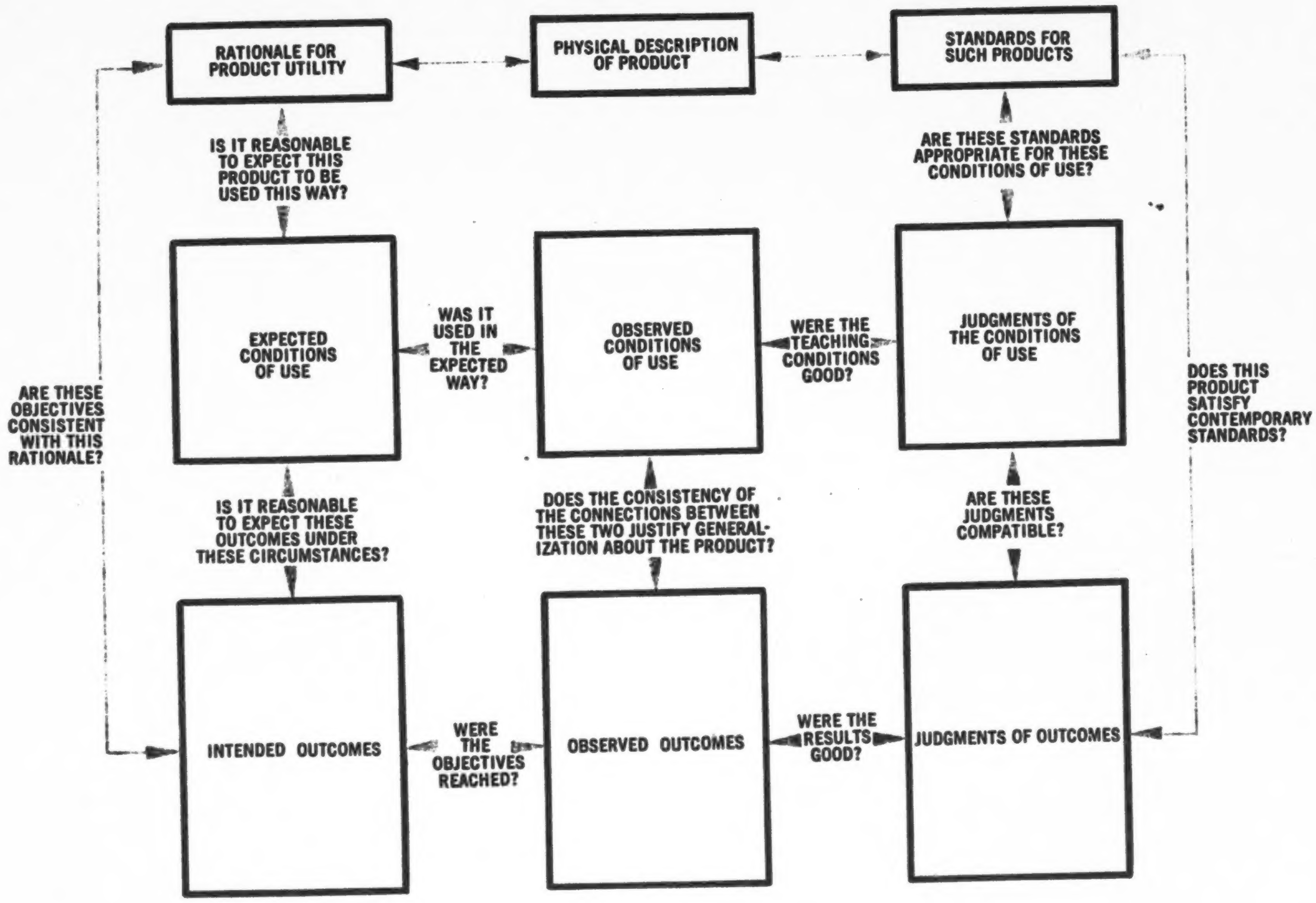

RATIONALE FOR PRODUCT UTILITY
PHYSICAL DESCRIPTION OF PRODUCT
STANDARDS FOR SUCH PRODUCTS
IS IT REASONABLE TO EXPECT THIS PRODUCT TO BE USED THIS WAY?
ARE THESE STANDARDS APPROPRIATE FOR THESE CONDITIONS OF USE?
EXPECTED CONDITIONS OF USE
WAS IT USED IN THE EXPECTED WAY?
OBSERVED CONDITIONS OF USE
WERE THE TEACHING CONDITIONS GOOD?
JUDGMENTS OF THE CONDITIONS OF USE
ARE THESE OBJECTIVES CONSISTENT WITH THIS RATIONALE?
DOES THIS PRODUCT SATISFY CONTEMPORARY STANDARDS?
IS IT REASONABLE TO EXPECT THESE OUTCOMES UNDER THESE CIRCUMSTANCES?
DOES THE CONSISTENCY OF THE CONNECTIONS BETWEEN THESE TWO JUSTIFY GENERALIZATION ABOUT THE PRODUCT?
ARE THESE JUDGMENTS COMPATIBLE?
INTENDED OUTCOMES
WERE THE OBJECTIVES REACHED?
OBSERVED OUTCOMES
WERE THE RESULTS GOOD?
JUDGMENTS OF OUTCOMES

Figure 2. A representation of the processing of the product information collected by EPIE.

cell at the center of the bottom row in Figure 1 repre- ts *observed* outcome information. The other two cells in bottom row of this graphic rationale represent (on the side) intended outcomes and (on the right side) judg- nts of merit and shortcoming of the outcomes. Behavior- cally minded advocates of "hard-data evaluation" will e that these three bottom cells contain, from left to right: avioral objectives, performance data, and systematically- led preference-ratings. Others may prefer more person- zed, less standardized statements of goals, outcomes, and lues. EPIE hopes to have both hard and soft data to ex- nge.

hen an EPIE staff member looks at the complete matrix breviated in Figure 1, he will see row upon row of lines rther subdividing any subcell shown there. He will expect use many variables (see Table 1 for examples) to describe product. Each variable has its own place in the fine-detail atrix, upon which intentions, observations, and judgments n be recorded. Just how the method works will be illus- ted in the next section of this article.

my way of thinking, the elements of any evaluation are ts of information. Each bit is identified according to di- ensions or characteristics that help to describe the prod- t. In the EPIE matrix designed to help the local decision- aker evaluate products, each dimension or characteristic is signed a row. Each source of information is assigned a lumn. A bit of information, then, has its own sub-subcell, uared off by row and column, identified by type and source information.

esearch rationale

OURCES OF PRODUCT INFORMATION

hen an EPIE staff member looks at the matrix he also sees lumn after column aligned for data from different sources, ith a separate column for each person or instrument col- cting the information. Most of this information is expected come from three major sources: producers, analysts, and sers.

he staff expects that producers will send useful descrip- ons of products, their developmental history, and—they ope—the results of field testing.*

bviously some producers will be more informative than thers, but EPIE has been assured by many that they will rovide the needed data.

dditional information will come from temporary or *ad hoc* roups of experts, each asked to examine specific features or products. One expert might be asked to compare projector lenses, another to search out implicit objectives in a "Teacher's Guide," and still another to document the value-commitment of a textbook author. These experts will usually have access to the product and its paraphernalia; only occasionally will they participate in the study of its actual use. Laboratory testing routines, when they exist, will be accessible to analysts appraising equipment, and content analysis facilities will be available to those appraising instructional materials.

The greatest flow of information will probably originate in the third source of data, the product users. Using both standard forms and open-ended protocols, the cooperating users will tell what they used, how and why they used it, and with what results. A few schoolrooms may be enlisted for studies "in depth", but the usual procedure will be to piece together small but overlapping parcels of information obtained from many users. Thus, the total sample will be more representative, and participating school personnel will be less burdened with the task of writing reports. To be sure, a plan that does not ask the same questions of every user will sacrifice an increment of stability in correlations among outcomes and conditions of use. However, the success of sampling methods by social science survey workers has persuaded EPIE that a more accurate picture can be assembled from bits and pieces of data from many sources than from massive data from a few users.

To illustrate how the matrix represents information of different origins and viewpoints, let us consider a sometime objective of algebra: the ability to calculate compound interest. To evaluate an algebra textbook we would assign this ability to a row in the information matrix. It would fall in the bottom section, along with other results-of-use, and toward the top of that section, because it pertains to a "Gain in Student Competence," the first "Results" subcategory in Table 1. This entire row, then becomes the "ability-to-calculate-compound-interest" row, across the matrix from "Intents" through "Judgments." What EPIE finds out about the author's expectation as to students' ability goes in a sub-subcell within the subcell headed "Intents; Producer." Test scores from a compound-interest quiz for a class using the textbook go within the subcell headed "Observations; User." Comments on the level of these student performances, as seen by an EPIE consultant (in this case, an expert in mathematics education), go in the same row, within the subcell headed "Judgments; Analyst." In this fashion, EPIE information is classified throughout the matrix.

It is presumed that each commercial product will have its advocates and detractors. It is not EPIE's purpose to tally them, or to seek some consensus of opinion about product utility. There may be a half dozen points of view about a product. EPIE hopes to learn them all, and share these points of view with potential users.

**The term "producer" here includes distributors, manufacturers, esigners, authors, publishers, R & D Center personnel, and any- ne who has been instrumental in making a product available to urchasers.*

What is the value of, say, a new geography kit? It is not unreasonable to suppose that pupils, parents, administrators, teachers, geography-education specialists, and geographers will have different answers, and that subgroups within these groups will have still different ones. Product value can be complex. EPIE hopes to sample enough sources of judgment to capture and reveal that complexity.

research rationale

THREE TRADITIONS

EPIE's research plan draws upon three prominent traditions in educational appraisal: a) a guidance and counseling tradition, b) an experimental tradition, and c) a school accreditation tradition. The concepts and methods of these traditions have been merged with such newer methods as subject-matter content analysis, behavioral task analysis, classroom interaction analysis, opinion surveys, and preference scaling to provide a library of techniques for EPIE's information gathering and processing.

Most of the aptitude and achievement testing techniques we now use in education were developed for guidance and counseling purposes. The primary reason for such testing is to describe a student's mental powers with reference to local or national norm groups, and to predict the student's future standing. In most popular philosophies of education, great emphasis has been laid upon individual differences among learners. Our technical definitions of reliability, validity, and errors of measurement and estimate are rooted in the concept of differences among individual examinees. Although not all school counselors choose an empirical base of test results for their work almost all test results have been designed for the questions that arise in guidance and counseling.

EPIE hopes to borrow from this tradition both in spirit and in technique. Much can be concluded about a product's impact from an analysis of individual student performances, and this is important data. But as Cronbach* and others have pointed out, the answers to questions about teaching practice, curriculum development, and product appraisal will often be new questions, and the methods of research will often be new methods, not the traditional psychometric ones. Variance among products is not equivalent to variance among students—and the former will be EPIE's focus. Product research needs its own measuring devices, but the traditional psychometric tests—paper-and-pencil, objective tests—will be emphasized only when they have obvious content validity, i.e., when they directly answer questions pertinent to the selection of instructional products.

The experimental technique is one of controlling "conditions-of-use" and the manipulation (controlled variation) of a main treatment to effect some carefully specified outcome. From an experimental study, the researcher hopes to learn something about relationships among a few variables. He hopes that these relationships do not exist under laboratory conditions alone—that they are independent of such incidental conditions as who the investigator is, what time of day it is, and the like—but he seeks at least to ascertain the extent of relationships when those laboratory conditions do exist. Findings from experimental studies in education are sometimes considered of little practical significance because the conditions of use are so unlike classroom conditions.

Product research is similar to experimental research in that the emphasis is on the relationship between treatment and outcome. But EPIE's studies will be more naturalistic. The conditions of instruction will not be controlled. Massive replication and careful analysis will be needed to rule out alternative explanation of the results.

The expectation is not that EPIE will conduct experimental studies, but that EPIE studies will reflect the experimentalist's concern for conditions of use and for relevant outcome performances. The EPIE studies will be "non-manipulative," even to the extent of refraining from an exchange of user information about the product and, in fact, from any professional discussion with participants while the study is underway. EPIE recognizes that the apparent worth of a product can be influenced by the very fact that observations are being made—an enormous obstacle to objective research.

In their efforts to measure accurately, psychometritians and experimentalists have denigrated the role of personal judgment. They seldom simply put their questions to the experienced practitioner. Not so the accreditation agencies. Their methods of appraisal depend directly on the educator's talent for assessing the quality of a program. An evaluation plan common to most school accrediting agencies calls for self-study by the school staff, followed by visitation by colleagues from similar institutions. Although there is public emphasis on tangible assets in the accreditation method, there is also substantial concern for any administrative and instructional conditions that obstruct the teacher. Emphasis is also given to important differences among the major sectors of the curriculum—science, social studies, and humanities.

The merit in borrowing from this tradition is obvious to EPIE researchers. First, there is the necessity of orienting EPIE activity to decisions made by actual users, in contrast to decisions made by developers, researchers, or theorists. Second, there is the necessity of being attuned to uniqueness in the needs of the different subject-matter departments, even in evaluating hardware or reference works which may appear to be independent of subject-matter usage. Finally, there is a wisdom among practitioners too precious to ignore,

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**Cronbach, L. J. Course improvement through evaluation.* Teachers College Record, 1963 hough many are the difficulties of validating that wisdom a technical sense. EPIE hopes to contribute to the refinement of observation appraisal methods, and to rely heavily n them.

or processing data, synthesizing findings, and interpreting elationships the talents of the logician, the philosopher of cience, and the historian should be added to those of the sychologist, sociologist, and economist. It will often be aluable to rely on frames of reference more or less indignous to these disciplines.

Perhaps the most general search among the data will be for (1) congruence between what was expected of the product and what actually occurred and (2) contingency relationships between outcomes and conditions-of-use which reveal the limits of a product's effectiveness. Automated data-processing techniques for teasing out congruence and contingency will not be available in the near future. EPIE will rely on researchers and analysts with a broad range of talents and diverse methods of inference to bring about some orderly confluence of data.

TABLE 1. Subdivisions of information classes for evaluating educational products

Subdivision	Examples of variables in the subdivision
CONDITIONS OF USE	
Local Circumstances	
Student types	(background, aptitude, aspiration, . . .)
Teacher type	(experience, style, personality, . . .)
Type of school	(physical plant, intellectual climate, . . .)
Type of community	(support of schools, attitudes, controversy, . . .)
Curricular Context	
Subject matter coverage	(concepts, structure, methods of inquiry, . . .)
Instructional aids available	(library, models, maps, equipment, . . .)
Concurrent coursework	(sequence and time allotment, projects, . . .)
Classroom Transactions	
Teaching strategies	(discourse, inquiry, assignments, . . .)
Student-Teacher interaction	(information, flow, counseling, . . .)
Student-Student interaction	(social climate, reaction to authority, . . .)
Incentives, grades, etc.	(motivation, goal orientation, testing, . . .)
RESULTS OF USE	
Gain in Student Competence	
Knowledge	(data, understanding, application, . . .)
Skill	(problem solving, communication, . . .)
Incidental learning	(synthesis, learning sets, side effects, . . .)
Change in Student Attitude	
Interest	(opinion, avocation, exploration, . . .)
Commitments	(prejudice, aspiration, advocacy, . . .)
Effects on Staff	
Teacher changes	(insights, revision, grievances, . . .)
Administrative changes	(organizational rearrangements permitted, . . .)
Other Effects	
Institutional effects	(prestige, solidarity, . . .)
Community effects	(controversy, dedication, esprit, . . .)

SPECIAL PROBLEMS

Though EPIE's primary methodological problem is one of relating goals and conditions-of-use to outcomes, other problems vie for attention. Many of them are old puzzlers among teachers, researchers, and producers of educational material. One such problem is the specification of target populations. Whom shall we ask our questions? What products do they want to know about? What schools will participate in the information exchange? What steps should be taken to assure that classroom conditions are representative? What steps will equate one study with another? Initial instructional-setting data will provide partial answers to some of these questions, but right decisions must first be made to collect the right data.

Any research study seeks generalization, but studies differ as to the level of generalization they seek. A study of one teacher's experience tells of the specific. The experience of a thousand sampled teachers permits generalization across teachers. The desirability of generalization across types of pupils, subject matters, regions, and time is also to be considered. The "basic research" study in education is usually indifferent to (allows generalization across) personnel, subject matter, locality, and time. The practitioner's inquiry usually calls for minimum generalization, because a purchase to meet some given need is in the offing. But EPIE will have many clients. EPIE's studies will specify the product, and search for generalization or limits related to types of pupils, teachers, schools, and so forth.

Another problem is that of comparing products with different purposes. No two instructional aids have identical objectives; won't an evaluation be fairer to one than the other? The EPIE plan is to ask some questions which will show each product in its best light, as well as in lights which are best for its competitor. Usually, one product will appear better under certain limited conditions, poorer elsewhere. A generous consideration of conditions should permit the potential user to decide which objectives, which conditions, and which products are most appropriate for his school.

Still another problem has to do with standards. Most operating standards are idiosyncratic and unconscious, serving to shape personal preferences, perhaps very consistently, but avoiding public exposure. The advocate of this or that standard may adhere to still others in his own practice. EPIE's purpose is not to show what is popular, but to reveal —to expose—the various expectations that exist. To be sure, exposure is easier planned than accomplished. Surveying every expectation is all but impossible; utterances both pertinent and suitably documented are difficult to find. A thorough presentation of existing standards is a formidable obligation, but a necessary one for a nationwide project.

A fourth EPIE problem is that of identifying school goals. Are products differentially useful depending on school goals? Of course they are. Along with other statements of opinion and judgment, school goals have a translation problem. Each goal has implications for practice, but spelling out what practices are consistent and what are inconsistent is not an easy task. Existing statements of objectives either are so general that they leave doubt as to what (if any) "good" outcome lies outside their scope or so specific that they guarantee incomplete coverage of what the educator believes he is and should be accomplishing. In addition, there is the problem of giving meaning to priorities. Scaling methods are available, but no satisfactory way of quantifying the importance of different objectives has yet been devised. Maguire* has recognized that priorities given to academic objectives may be seen as indices of the time to spend pursuing them, as indices of the extent to which remediation should be carried if the objective is not achieved, or as indices of personal commitment and value. How can goals be quantified unambiguously? EPIE will try. Hopefully, more definitive scales for goal priorities will be a byproduct of the EPIE studies.

research rationale

CHECKS AND BALANCES

Recently, one producer of educational products said, "I don't worry that EPIE will accuse us falsely, but that it will damn us with faint praise." Failure to recognize important distinctions, on the one hand, making too much of small distinctions, on the other—these are perils on either side of a narrow path. How can EPIE keep to the straight and narrow? Obviously it is necessary to have a staff immune to alliances with or grievances against producers, and to accept from producers no support of any kind, e.g., advertising, free product samples, and so forth. But beyond such administrative and commercial safeguards, there are research checks and balances to invoke.

One principal safeguard is the deliberate over-inclusion of descriptive variables. Redundancy (ask the same question several ways) and extended boundaries (ask some peripheral questions, too) will lessen the chance of false cause-and-effect reports. A welter of data will make any one finding less critical. Only if everything goes badly—a very unlikely result—would a general condemnation be appropriate. The probability of a general commendation is equally small. This may be the danger the producer feared—that mention of merit would be so buried in data that, in effect, merit would not be acknowledged. But this seems the lesser danger. Over-inclusion of variables is one of the safeguards EPIE will employ to ward off judgmental bias.

**Maguire, T. O.* Value Components of Teachers' Judgments of Educational Objectives. *University of Illinois, Unpublished Doctoral Dissertation 1967.*

It is the user—not EPIE—who must sort the descriptions and judgments to find the bases for local decisions. Classifying or ranking products as to such factors as cost, reading difficulty, or durability, may be useful—but classifying or ranking them as to overall merit is not EPIE's plan. This restriction on grand inference will be a second safeguard against misinformation.

A third safeguard will be a reinforced striving to improve the accuracy and precision of measuring devices. When in full swing, EPIE expects to make contributions to the technology of educational measurement. The search for new and better techniques should be manifested in a healthy skepticism toward the credibility of its own findings. Estimates of confidence in its findings should be apparent in the reports of product usefulness.

The ultimate validity of any technique is established by outside criteria. We do not anticipate that an outside, hard-data criterion will soon be available against which to validate EPIE's research activities, but other criteria should be available before long. Clinical practice among educational planners should be influenced, and studies should show that influence. EPIE will be tested in the field. If its information is useful, more and more decisions will be shaped by it. Validity is not assured by use—but nonuse suggests low validity. Knowledge of what is done with EPIE information is another check upon the system.

These checks are insufficient to guarantee honesty, candor, and relevance. Professional educators must also monitor the work. EPIE is considering the need for an independent board of examiners to aid them. Such a board could draw criticism and advice from the professional educator, on the one hand, and from the producer, on the other. Chosen by professional societies, though not necessarily official representatives of them, the members of the board would examine EPIE procedures and reports, investigate and endorse justified appeals for redress, and publish critical reviews. Space in EPIE publications can be made available for their reactions, but other outlets will be needed as well.

The research plan described here is not a hard and fast plan, as any research designer is aware. But no hard and fast plan is wanted at this point. The procedures of gathering data, drawing up limitations of product effectiveness, and exchanging information are expected to evolve, improving as new techniques are tried and as feedback on the system itself is available. Just as EPIE seeks generalizations about products, noting their impact under various conditions of use, it also seeks to understand the generality and limitations of its research plan. This paper has indicated where it starts.

Robert E. Stake, Professor of Educational Psychology at the University of Illinois, is Associate Director of CIRCE—the Center for Instructional Research and Curriculum Evaluation. His sound and creative approach to gathering and dealing with data, his intellectual curiosity about the value of "soft data," his uncompromising integrity are revealed in this paper.

Among other activities and positions, Dr. Stake has been a Psychometric Fellow at Educational Testing Service, has taught at the University of Nebraska, and has been a research consultant to the U. S. Office of Education, the North Carolina Advancement School, and the Cooperative Educational Research Laboratory. He edited the highly provocative Issue No. 1 AERA Monograph Series on Curriculum Evaluation *(1966). Perhaps most relevant to EPIE among his published works is "The Countenance of Educational Evaluation," which recently appeared in Columbia University's* The Teachers College Record.

Appendix K: From The EPIE Forum, September, 1967

can epie help teachers and students "tell it like it is"? (part 1)

Terry Denny

The phrase, "Tell it like it is," is popular with a segment of youth often antagonized by and antagonistic to education. The intellectual and emotional content of this message reflects an increasing social commitment to attack the real, everyday practical problems of a growing, if not yet a great, society. No widespread hue and cry has been taken up by youth in the schools for educational evaluation as such. Although students' general concern with the quality of their instruction is evident, their specific concerns usually amount to some displeasure with a particular group of teachers, with the behavior of certain administrative personnel, or with their rights to assert themselves in some manner or another.

There is, however, evidence that a growing segment of professional educators charge educational researchers with conducting surveys, field studies, controlled comparison experiments, and laboratory research which either fail to "tell it like it is," or show little promise for influencing ongoing school practice. Nor are they pleased with their own results of conducting do-it-yourself educational product-assessment and curriculum-research studies. Out of these concerns have grown several groups, centers, consortia, which are national in scope and ambitious in purpose. One wonders how these will succeed where so many have failed.

Paul Mort (1), for example, over a period of thirty years, conducted exhaustive studies of how an educational idea gets into practice in school districts. He devoted a professional lifetime and directed the work of several other people in an attempt to attack a real problem in the real world of the school decision-makers. Researchers interested in extending or replicating his work and practitioners interested in solving their school problems find the commonsense constructions reported in his research nearly impossible to apply.

There are obvious differences of intent for the educational researcher who seeks to advance today's speculation toward tomorrow's knowledge and the school practitioner who needs to make today's decision. The researcher speculates about tentative research findings; the user wants evaluative statements on which to base judgments. The user's professional day is carried on a continuous stream of decision-questions: Is this year's reading series working better than last year's? Shall we adopt this science textbook or that? Which overhead projector shall we buy? Which of our current curricular materials shall we continue to use, discontinue, amend? He is not satisfied with the local information he has at his disposal. He finds it too informal, incomplete, perhaps inconsistent, and turns to promotional literature he has received from publishers and other producers and perhaps to educational research journals for published outcomes of curriculum-research studies.

Reading the producers' promotional literature often does elp him evaluate the absolute or relative performance e products he is interested in for use in his schools. he digs into the research journals for help he emerges no fewer questions and may feel that the researchers etting him down by not attacking his real problems. To frustration add the likelihood that he is lacking neces- time, money, and staff competence to conduct exten- product-comparison studies. At this point, after some ussion with a fellow teacher, curriculum coordinator, inistrator, or salesman, he decides to "go it alone" on ntuitive basis.

fabricated decision-making cycle pleases no one, yet ists. Why? I think the educational decision-maker deals his professional world practically. He is inclined to each event as a self-contained problem. He has grown ustomed to working with, perhaps expecting, incom- e product information on which to make decisions. blems arise, decisions are made, things get better. His ics are often ingenuous, his strategy unformulated. le is learned that can be communicated. These devilish s between what decision-makers want, what research- do, and what might change the way things are have n treated searchingly in separate works by Robert Stake D. L. Clark and E. G. Guba (3), and Matthew Miles (4).

e EPIE system could provide the practitioner with the ltidimensional information which is needed to transform current hunches into rational hypotheses, to enrich his rochial viewpoint with reliable product performance in- mation based on a nationwide sample. Notwithstanding risk of a tautology it seems important to note that the IE assessment model itself has demonstrated logical con- uence to date, but awaits the test of empirical analysis. e proposed pilot study of elementary school science oducts in four Eastern states will provide EPIE with its tial empirical feedback. These first steps toward establish- an information system to provide dependable product rformance will, it is hoped, stretch into full strides toward oviding solid product information to those who must ar the responsibility of making educational decisions.

e first general guidelines of this emerging system have en drawn elsewhere in this issue of *The EPIE Forum.* r. Stake's paper is crucial to understanding the EPIE proach to describing fully and fully judging a product's rformance. The model includes logical and empirical alyses of the intentions and the outcomes of the pro- ucers and users of educational products. Doing an effective b of telling it like it is begins with descriptive compari- ns of the aims intended by the writer, producer, manu- cturer of a product with the aims intended by the teacher, arner, administrator, supervisor, user of that product.

ating goals, objectives, aims and the like meaningfully is burdensome task. Percy Bridgeman (5) championed the course of operationalism in his classic *The Way Things Are*. His aim was not specifically to influence educational researchers, evaluators, or decision-makers. Rather he sought to promote an approach to grounding knowledge in precise language with empirical references. The popularity of the standard assertion of the positivist that "whatever exists, exists in some amount and that amount can be measured" can be traced to Bridgeman's efforts. It is difficult to find a well-marked trail from his early work to the burst of interest in stating objectives operationally. What is observable is the historical debt we owe to Bridgeman's work. Consider for example the recent work of Mager (6) and Gagné (7). Gagné has asserted that the "central focus for change in educational practice during the past decade has been curriculum." These curriculum innovations fly on the wings of products designed to carry their unique messages into the classroom. He also cites the absence of systematic investigations of the effects of introduction of new curricula. Gagné feels that educational content is derivable only from educational objectives. For example, one cannot select content as one might an overhead projector, science textbook, or social studies materials. Rather the content of a curriculum is the operations a learner acquires under a single set of specified learning conditions. Bridgeman suggested that often answers were prematurely sought before the right question had been asked. Similarly, Gagné has suggested that inferring curricular objectives is primarily "a matter of asking the question of each task." While some views of curricular evaluation have the deceptive appearance of being *simple,* I tend to concur with Ahmann that the task is better understood as *horrendous.* But analyses of intents must be undertaken to give meaning to the results of using educational products. EPIE must attempt to navigate a true evaluation course between the attractive Charybdis of using well-tested but inadequate methodologies and the beckoning Scylla of employing untested but seemingly more appropriate procedures.

The recent flurry of announcements about marriages of "hardware" and "software" partners—electronics firms and publishing houses—for the purpose of producing new instructional materials has increased further the interest and concern of educational decision-makers. Romances are nearly always heady for the participants but can be stressful for other interested parties who are often called upon to suffer, support, and assuage the couple and their issue should the plans go awry. We will have to have the forebearance, faith, and good judgment to await the first marketable products of these mergers.

I would like to discuss a currently minor but predictably greater problem which will visit educational decision-makers and EPIE. I refer to the likelihood of a great number of producers marketing a still greater number of products, the need for which may be questionable. A great number of product models could be fully described by EPIE and the prior question as to the real need for *any* models of the product would remain unanswered. EPIE will have to exercise considerable care in maintaining current product performance records lest it present outdated information. Furthermore there is the risk that effective educational products not profiled by EPIE could be viewed with disfavor by EPIE's clientele. EPIE must have built-in safeguards against such misuses.

At this time, EPIE can but acknowledge its responsibility to be on guard in these matters. The verbal *beau geste* followed by inaction is all too frequently observed in the educational world. EPIE's responsibility is not met by the announcement of such intentions but the likelihood of its successfully completing its mission is increased by its awareness and willingness to meet the issues head on.

(The conclusion of this article will be in the October issue of *The EPIE Forum.*)

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From 1960 to September 1967, when he became Senior Staff Associate and Coordinator of Field Research for EPIE, Terry Denny had been Instructor, then Assistant Professor, and then Associate Professor of Education and Psychology at Purdue University. Earlier, Dr. Denny was an elementary school teacher in the Livonia, Michigan, Public Schools and has had Graduate Assistantships at the University of Illinois, where he was awarded his Ed.D. in Educational Psychology in 1962.

He has written scores of papers, abstracts, essays, and reviews for a variety of journals and other publications, concentrating on the areas of reading, of anxiety-creativity, and of achievement of religious values (particularly in connection with the Study of Catholic Education at the University of Notre Dame). He has served as a reading consultant to American Book Company and has received research grants for a reading study from the Purdue Research Foundation and Scott, Foresman & Company. An educational researcher committed to designing sound techniques and mechanisms for EPIE's developing system, Dr. Denny begins in this issue of The EPIE Forum *an account of how EPIE will gather user information; the conclusion will be published in the October issue.*

From The EPIE Forum, October, 1967

(PART II)

CAN EPIE HELP TEACHERS AND STUDENTS 'TELL IT LIKE IT IS'?

By Terry Denny

Educational materials are currently purchased on every criterion except the results of their use in the classroom, which is the principal source of information about the effectiveness of a product. Robert Stake has called this source the "condition of use" in his September *EPIE Forum* article, "A Research Rationale for EPIE." The "conditions of use" subsume the teaching transactions, and a product's outcomes are the results of its use. Classroom observation schedules, such as Flander's Interaction Analysis technique (1960), are useful approaches to charting instructional transactions. Outcomes can be seen to involve students, teachers, curriculum supervisors, administrators, parents, the community, as well as certain features of the physical environment. Information can be gathered by check-lists, inventories, questionnaires, tests, and by classroom observation. Whatever the particular approach, EPIE will attempt to use nonreactive measures to avoid intruding on classroom practice wherever possible.

Most users will be concerned with teachers' and students' views of the product, with its effects on students' knowledge and skills, with its behavior relative to other similar products, and with its effects on students' interests and attitudes. So will EPIE. The information will be "hard" and "soft." There are many ways to describe and judge a curriculum product, and the family of educational materials has some remarkable specimens. Those who describe all educational matters solely in behavioral terms remind us that EPIE must keep its descriptions objective, its observations pure. It is easy to agree with the aims of the behaviorist and to recognize the danger of faddism as well. When an either/or proposition is made about the use of operationalism in educational research and about the value of an educational product, I am reminded of Nietzsche's label for false doctrine, "the dogma of immaculate perception." The observer interacts with the observed. He changes the instruction by his presence, and he is changed by what he experiences in the instructional setting. No amount of operationalism will make our measures completely nonreactive, our perceptions pure.

The relevance of hard data is open to question, regardless of how tidy the research design may have been that produced the well-controlled findings. This is not meant to deny the validity of the experimental study; quite the contrary, it has enabled much of EPIE's vision. The point is not to pit one methodology against another. Rather, we seek to find whatever coherence is possible out of them all—without resort to ideological struggles.

Informal evaluation procedures make use of instructors' opinions. EPIE will also. We propose to exercise considerable care in our selection of a sample and to utilize a structured and open-ended interview schedule to harden this very useful soft approach to gathering information. Similarly, we have taken another look at an old educational evaluator's chestnut, that of pondering the logic of a program. To this end EPIE has encouraged several curriculum content analysis groups to develop and test systems for studying the content, rationality, assumptions, values, promises, pedagogical imperatives and required educational technology to be found in the content of educational materials. These and other analytical and empirical techniques will be field tested in a series of forthcoming studies which will be conducted within a large-sample pilot study.

THE PILOT STUDY

A large *cadre* of professional field workers will be coordinated by the Institute in its four-state pilot study. We are limiting our pilot to the study of outcomes related to elementary science instruction materials. In addition, the use of the overhead projector has been selected as an example of educational hardware to be examined. Research workers will gather data on the teachers' aims for these materials. Teachers' descriptions of intents will be related to their methods of using them and to the empirical results of their use. Students' intentions will also be explored. But, the emphasis will be placed on variances among educational products rather than among the learners. The principal criterion for product evaluation is its absolute or relative effectiveness in accomplishing its aims. This judgment may be made by comparing the results of use with other competing products, with the users' intended outcome, and with producers' avowed goals for the product.

Ludwig Mies van der Rohe's architectural principle, "less is more" seems apropos of this emerging concept of educational product evaluation. Relative product performance comparison data should reveal that one product is preferable to another for a particular user's instructional setting. The fewer the gray areas of information about product performance, the more certain the user can be.

Other types of outcomes which interest us include the implications for teacher education and in-service education which certain materials may portend; the effects on student and teacher morale; possible contingencies with grading schemes and reporting to parents; the implications for administration, scheduling, and supervision; the need for supplementary materials, tutors, field trips and additional facilities; and the effects that products may have on other aspects of the curriculum for which they are not formally intended. Beyond the outcomes in evidence when formal instruction is concluded lie important results of use such as the students' application of knowledge, transfer, retention and ease of re-learning.

PRODUCT ASSESSMENT IN THE SCHOOLS

The Institute envisions a new cooperative role for school districts in curriculum evaluation projects. The innovation and research of educational products are not the most appropriate tasks for school districts to assume, as we see it. Rather they must lead in the development of demonstration, trial and modification of the products to the local requirements. Consider this view of the schools' role in the light of Robert Stake's *caveat*, "Even in an informal way, no school can evaluate the impact of its program without knowledge of what other schools are doing in pursuit of similar objectives."

Criteria vary from stage to stage in curriculum development throughout the instructional year of a teacher. This should give us pause in considering the appropriateness of a univariate comparison model to assess product performance. One could select a significant variable, do a comparative study, select another, and so on. What a relatively simple matter the task would be! The utility of such comparisons is dubious. We must resist demands for simple, univariate comparisons. Products will have many characteristics, and the characteristics will be of unequal importance. The composite picture will result from myriad bits and pieces of many educational scenes rather than a detailed painting of a few. Judging which characteristics to attend to, and which programs to use as references are *the* tasks for EPIE. We earnestly call for your help in solving these basic problems of product assessment in the schools.

To the fellow professional who observes that there is nothing new under the educational sun, we submit he has been in the sun too long. We invite him to step back, read any of the recent, provocative works of Tyler, Stake, Gagne, Scriven (1967), Gordon (1967), and Morrissett (1966), and help EPIE take the next steps forward. The phoenix-like resurrection of curriculum research and the emergence of new approaches to new problems encourages us that the time *is* appropriate to find out the way things are and to measure what the teacher and the student intend to have happen with instructional materials. Obtaining authentic statements of intent is a new challenge for the educational evaluator. Teachers must be queried, their views systematically gathered and processed, and added to students', parents', superintendents', and curriculum specialists' views on the merits and the shortcomings of products. These groups have important opinions on education. Their views are needed to produce a map in sufficient detail to be truly useful as a guide to decision-making. Controlling bias in this kind of information presents a very real problem. However, the need for results of use data makes it worth risking the bias that may creep into the system.

To see educational life in the round, to avoid parochialism in methodology as well as in interpretation, and to begin the exchange of information among educational professionals about product outcomes have already convinced The EPIE Institute that it is going to be hard work. Certainly little of it could be called romantic. If it were, the current charismatic leaders of educational movements would already be about these tasks. Melville believed no one had to sail in whaleboats to find sharks. The voyage to a fully operational information exchange about educational products may be longer and more treacherous than first appeared. Hard work and patience are the tools at hand to implement the Institute's rationale.

A FINAL WORD

The information related to the results of product use which The EPIE Institute will provide is not intended to describe school or school system policy. It is intended to describe the instructional *outcomes* and accompanying *practices* which have occurred in the use of the product. The Institute's report to its clientele will not provide *the* curricular model, *the* criteria list, *the* best product. There is no need to ordain a criterion or a method. There is, in fact, much reason to avoid assiduously this cultish danger. The very *idea* of some sort of a final ranking of products is outrageous and would of necessity tend to reduce rather than facilitate information exchange.

Rather, the Institute's services will enable the client to have a greater quantity of relevant information to guide him in *his* own decision-making regarding the use and purchase of educational materials; to have more information on which to base *his* own research; and to have sound information to guide him in determining his future educational needs and policies. The *user* must use EPIE to find bases for *his* local decisions. When reliable, comparable, information about educational products and their results of use is made available on a nationwide basis, we envision a significant improvement in the quality and effectiveness of educational decision-making about the purchase, use and modification(s) of educational products.

Product profiles which report the results of use will not be simply put, easily perused or quickly implementable. A stable characteristic of the educational market place is change. Considerable change increases complexity. Since the form of educational product information will, of necessity, be complex, it is crucial to design a *system* which will be quickly and persistently collecting, processing and modifying information on the results of use. Outdated information could be useless, or misleading. Ideally, today's data should be transformed, translated, and transmitted immediately. Alas, the world of the classroom does not permit the happy state of instantaneous gathering, processing, and reporting of information. But EPIE does not promise happiness. Even if the problem of data-lag were licked, accurate, complex, up-to-date information will make some users quite unhappy.

But it is also likely that continued ignorance will make such users no more comfortable. If we cannot get along with complex information about a complex problem, we certainly shall not get along with simple solutions to them unless we are compromisers at heart. When we attest to our heartfelt dissatisfaction with the lack of useful performance information on educational products, we can be sure that some unhappiness will result from our attempts to change things. That's the way things are. Harry Golden has written that unhappiness is a cobra which will not strike you unless you startle it. Let's risk it in trying to help teachers and students to "tell it like it is."

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This article and the article which appeared in the September EPIE Forum *were written by Dr. Denny in his role as an EPIE consultant prior to his appointment to the Institute as Senior Staff Associate and Coordinator of Field Research. From 1960 to this September he spent his time as an educational psychologist in the Departments of Education and Psychology of Purdue University. He received his doctorate in elementary education from the University of Illinois in 1962. He now spends his days at the Institute hard at work translating consultation rhetoric into plans for field practice.*

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